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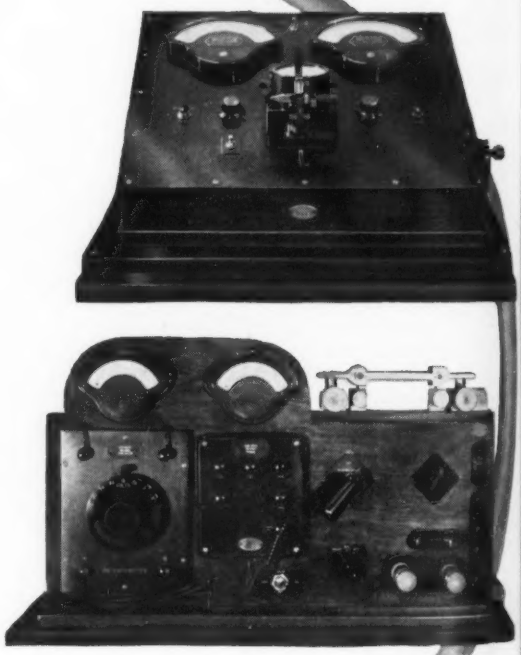

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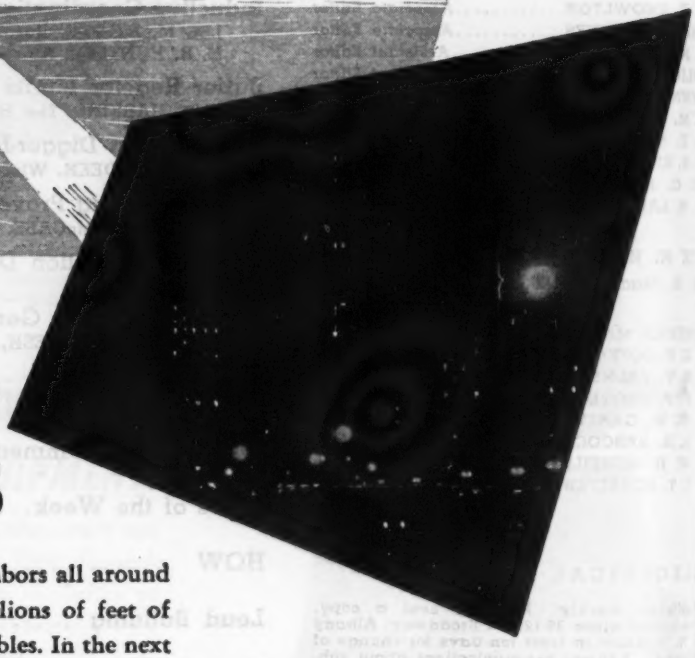

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LABOR *and* MANAGEMENT MEET— *for* PEACE *or* CIVIL WAR?

THE prospect of a knock-down and drag-out fight in the automobile industry does not augur well for the reconversion outlook, which upon every other score is bright. Any widespread outbreak of the type of industrial warfare which now threatens will disrupt, more thoroughly than anything else on the horizon, an orderly transition to a peacetime economy.

It is doubly unfortunate that there should be a general tightening of union and company battle lines upon the eve of the Labor-Management Conference, which on November 5th will convene at President Truman's direction for the purpose of "working out by agreement means to minimize labor disputes." If the current work stoppages occasioned by industrial conflicts should increase rather than diminish between now and November first, the Conference atmosphere hardly promises to be favorable to a dispassionate examination of basic issues.

Yet the shadow of the threatened industrial storm that hangs over the Conference only serves to emphasize the importance of reaching satisfactory agreement upon two problems with which such a Conference might deal. The first is that of determining what machinery shall be used for settling disputes upon which employers and workers have reached an impasse. The second, and more far-reaching, is that of arriving at some common understanding upon the major issues which commonly lead to irreconcilable disputes.

Settlement of Wartime Disputes by the War Labor Board

During the war the first problem was handled largely by machinery centered in the National War Labor Board. Supported by general adherence to patriotic pledges by labor leaders and employers not to resort to the use of economic force against each other during wartime, and backed up on rare occasion by use of the President's power to seize plants for war purposes when its orders were not obeyed, the Board managed, by what amounted to compulsory arbitration, to settle the nation's wartime labor disputes with relatively little economic loss.

But it can scarcely be claimed that the War Labor Board did much to resolve the issues from which disputes grow. Indeed, the fact that it was available to issue orders in cases which the Secretary of Labor certified as likely to "lead to substantial interference with the war effort", resulted in the conversion into full fledged disputes of many disagreements which would otherwise have been settled at a local level in the course of collective bargaining. Meanwhile, local collective bargaining machinery which should have been doing most of this work was neglected, and will need thorough reconditioning even to be brought back to its prewar level of effectiveness.

With V-J Day came an abrupt change in the status of the War Labor Board. One of its main props, labor's "no strike pledge", was promptly withdrawn. It could no longer rely on the President to use his power to seize plants for war purposes to force obedience to its orders. Consequently the Board agreed that it would accept new cases only if both parties to the dispute stipulated in advance that they would abide by the Board's findings, that it would clear its dockets of old cases as rapidly as possible, and that it would then go out of business, leaving to the Labor-Management Conference the question of what should take its place in the postwar period.

What Shall Take the War Labor Board's Place?

The immediate and pressing task of the Labor-Management Conference is to agree upon machinery for settling industrial disputes in the peacetime economy.

Neither management nor labor wants the continuation of compulsory arbitration to which they submitted as a necessary war measure. But it must be clear to everyone that if any substantial proportion of the disputes that inevitably arise are settled by resort to strikes and lockouts, economic anarchy will result. Not only will it be impossible to achieve the high levels of output and employment that have been set as postwar goals, but it is questionable whether our economy could survive. The only alternative to compulsory arbitration under government auspices is for management and labor to demonstrate their ability to effect a peaceable resolution of their differences without it.

The most obvious need is to set up local machinery at the grass roots where disputes originate. That is where most of them should be settled by local negotiation and, when that fails, through voluntary submission to mediation or arbitration under terms of reference to which the parties agree. Many issues, which at plant level are relatively simple in character, are blown up to formidable dimension and complexity when they are passed along

the line for decision in Washington. The centralizing process is one that frightens everyone connected with it because it focuses attention upon the possible importance of precedents established by a decision, rather than upon resolving satisfactorily the particular dispute at hand.

Unquestionably, some Federal machinery must be provided which may be called upon in cases where the size or implications of a threatened dispute clearly run beyond local jurisdiction. That will mean the thorough revamping of conciliation and mediation machinery which exists, but which has grown rusty through disuse while compulsory arbitration was the order of the day.

At least, this involves a complete overhauling of the United States Conciliation Service with a noteworthy strengthening of its personnel. There may be wisdom also in recently advanced suggestions for the creation of a board of arbitration to act in cases voluntarily submitted by the parties concerned, and for boards of inquiry to make reports upon the merits of disputes in which the public interest is concerned. But there is valid ground for questioning what appears to be the common assumption that such machinery should be located in the Department of Labor. It belongs neither there nor in the Department of Commerce. For the work which such agencies are called upon to perform, both the appearance and fact of complete impartiality are essential to effective performance. Assurance of impartiality will not be fostered by placing them in a department specifically charged by Congress with the task of advancing the interests of wage workers.

Resolving the Issues Over Which Disputes Arise

It may be, as many think, that the forthcoming Labor-Management Conference cannot effectively handle any problems beyond the procedural ones suggested above. If that is true, its agenda probably should be restricted to planning the reconstitution of collective-bargaining and dispute-settlement machinery, in view of the urgent need for putting it in working order.

But either in this Conference, or in subsequent ones, there will have to be an attempt to reach a reasonable measure of labor-management accord upon certain basic issues over which most industrial disputes originate. The best of machinery can be swamped if disputes are generated in ever-increasing number.

Most important of such issues is that of the fair determination of wages. There is clear need for reaching agreements at least upon the major factors on which such determination should rest. It seems evident that if we are ever to hope to reach the high levels set and generally accepted as postwar goals, we must harness economic incentives to promote production efficiency. That means that workers, as well as management, must be given a genuine stake in increased productivity. No universal formula is possible, but we should be able to agree upon general principles for dividing returns derived from improved performance in output between workers and investors, and consumers in the form of lowered prices.

Again, since unionism is here to stay, general acceptance by management of the principle of collective bargaining would save innumerable disputes which are concerned more with the method of negotiation than with the concession sought. Few in management still question the validity of the collective bargaining process as such, but there are many matters to be resolved of which the question of the open shop, the union shop, or the closed shop is merely a conspicuous example, upon which there is wide divergence of conviction between and within labor and management groups.

On the management side, there is sincere concern about the intent or ability of union leaders to exercise responsible control that assures compliance with contractural obligations. Wild-cat strikes are of sufficiently frequent occurrence to give substance to this distrust, and union discipline seldom has been administered in a decisive or effective fashion. The prospective rivalry of three competing labor organizations of national scope gives management little confidence that a bargain made and kept in good faith with any one of them provides assurance against work stoppages.

All of these matters, and many others, need thrashing out between management and labor, with the view of arriving at as large a measure of specific and detailed agreement as can be achieved. The greater the area of such agreement, the smaller will be the area for disputes that must be handled by settlement machinery, or put to the final test of force.

Peace or Civil War in Industry

The Labor-Management Conference is of major importance to national welfare. It is important even if it restricts its objectives to the procedural problem of how industrial disputes are to be handled.

It can make an even larger contribution if it lays the groundwork for an attempt to reach working agreements upon such policy issues as have been cited above.

Neither management nor labor can afford to lend anything less than their best intelligence and effort to an attempt to arrive at common understanding. Success will mean that we have a genuine chance of reaching new levels of economic well-being. Failure will mean industrial civil war, in which the casualties will be high. One almost certain casualty of such a war will be the principle of collective bargaining, since the Government can scarcely refrain from establishing compulsory arbitration if sufficient breakdown occurs.

It is to the vital interest of both management and labor to demonstrate that they can responsibly control themselves.

President McGraw-Hill Publishing Co., Inc.

Electrical World

OCTOBER 13, 1945

Today's Greatest Challenge

EVER SINCE the bottom of the depression wages have been increasing, with the result that we enter the post-war period with wages at the highest level ever attained and still they are increasing without the end in sight. How can wages increase, people ask, without raising prices? That is the $64 question with which the Administration is now wrestling.

Prices cannot stay at pre-war levels when wages are substantially higher, nor will they. Once the dam is breached the revision will be general, and labor, finding it has earned little if any real wage advantage, will start the spiral all over again.

Where will it stop? Can a higher level be achieved without dangerous inflation? That some inflation is here and more is on the way is a fact. To stop it short of real trouble without government price control requires, among other things, greater production per labor-hour.

Here is something that can be done—something which offers a real opportunity to the electrical industry. Never before was there so great an incentive for the industry to work together. Never before was there so great a need not only for knowledge of industrial processes but for imagination.

At one time electrification meant the application of labor-saving devices but today it takes on a new and more constructive meaning, that of keeping all labor employed but at a higher production rate. By so increasing the productivity of the worker, the labor cost per item is held down as well as the overhead, and prices by reflecting these savings can stimulate further buying. Then will labor have achieved an advance in real wage and real purchasing power.

Any fears that industrial power demands would drop off after the war and take years to re-establish the 1944-45 records are unjustified in the light of the needs of our American economy. The only limitation the electrical industry will have will be its own vision, its ability to grasp the full significance of the opportunity the situation offers and apply itself accordingly.

Whenever the application of electricity, be it in light, heat, control or power, will reduce the time per operation its use should be known and placed before the industrial customer. So great, however, is the need that we cannot be satisfied with the leisurely sales methods used before the war. Today we must work faster. Today we must employ many, many more power salesmen so that contacts with industrial customers large and small will be more frequent.

While the lion's share of the effort will necessarily fall on the power salesmen of the utilities, the task itself is too large to leave to one segment of the industry. Just as years ago other phases of electrical marketing demonstrated the value of coordinated activity, so will this industrial task find its speediest fulfillment to lie in cooperative effort. National and local programs promoting the benefits of purchased power, accumulation of application data and results, sales training programs, adequate wiring, to mention only a few, can speed up the work.

By placing behind the worker more power than that enjoyed by any other nation, electricity helped greatly to bring victory, but to enjoy the fruits of victory we now need to do an even greater job of electrifying industry. It's today's greatest challenge.

Inductive Coordination of REA Lines and Bell System Lines

Coordination engineers know from years of mutual effort how to resolve interference problems that may accompany prospective extensive rural program—Over-all system approach makes corrective measures easier—Cooperation of manufacturers of generators, transformers and telephone apparatus facilitate program

*LEE M. MOORE and H. R. HUNTLEY**

ELECTRIC POWER and telephone distribution systems must necessarily be close together in many cases because they serve the same people. Under these conditions, noise may be caused in the telephone circuits by induction from the power system. Unless precautions are taken, this noise may in many cases be great enough to impair telephone service; in extreme cases, it may make telephone service impossible.

Program Initiated Early

Induction problems are not new; they started around 1880. In those early days little was known about the factors involved, and controversies between the electric power and telephone industries were many. Fortunately, there were far-seeing men in both industries who recognized that electric power and electric communication were both essential to the American way of life, and that, after all, induction was simply one more problem that had to be—and could be— solved by the engineers. True, the solution would require the cooperative effort of the engineers in two great industries of quite different types, but, these men reasoned, this should not be a handicap; it might even stimulate more effective work. This proved to be the case, and so successful has this cooperative endeavor been that, while the technical problems of coordinating power and telephone systems have grown in number and complexity, serious controversies over induction have almost reached the vanishing point, and the few that do arise usually do so because not all the facts are known.

This was the status of inductive coordination when the Rural Electrification Administration started its program of rural power line construction. Because of the long history of successful coordination of power and telephone systems and of the testing techniques and apparatus which had been developed, it was practicable for the REA and the Bell System to start almost immediately on a joint program of investigations.

The problem presented some interesting aspects. Several hundred small operating groups, the cooperatives, were in the process of formation. To them inductive coordination was only one of many immediate problems. The speed with which rural electric lines were being built demanded something approaching a "mass production" technique for handling induction problems.

Field Studies Instituted

It was decided that the best way to develop the necessary techniques was by a series of field investigations. By July 1939, REA had set up a two-man "test" crew equipped with a truck loaded with testing equipment and work started in earnest. The first field job involved a problem in the vicinity of Quincy, Illinois, which turned out to be rather complex tech-

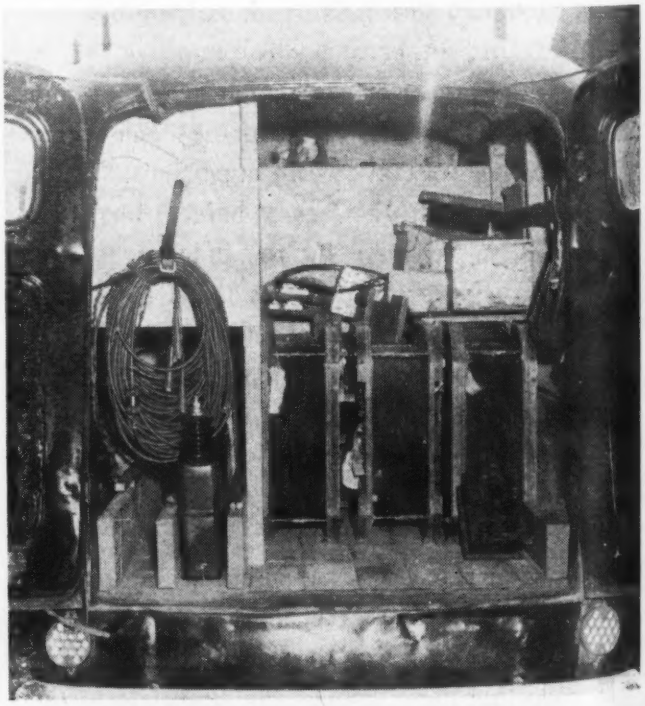


FIG. 1—Coils and capacitors used for experimental power line shunts are stowed in the test truck. Meters and supplementary equipment in upper compartment

* Rural Electrification Administration and American Telephone & Telegraph Co., respectively.

nically. The REA test crew, together with an engineer each from the A.T. & T. Co. and the Bell Telephone Laboratories and several people from the local power and telephone organizations, worked about a month on it.

Since the Quincy tests more than 20 other situations in a dozen states from Washington to Florida have been similarly investigated. In addition, the REA has conducted numerous cooperative investigations with other communication organizations. The 1940 REA Annual Report says: "REA cooperatives continue their policy of cooperating with telephone companies in planning the locations of proposed electric power lines so that exposures between power and telephone lines will be kept at a minimum. REA engineers assigned to spend full time on inductive coordination problems, as related in last year's report, continue to make tests and studies to seek the correct engineering solution to any particular induction problem."

As more experience is gained, the investigations increase in efficiency. It is now not at all uncommon to complete the field work in a problem involving several hundred miles of rural power and telephone lines, of which anywhere from 10 to 50 percent may be involved in inductive exposures, in four or five days.

Over-all System Approach

Besides being efficient, the technique of handling problems on an *over-all system* influence and susceptiveness basis is proving economical. The net cost of measures to correct the influence or susceptiveness of a whole system is frequently less than that which could be involved in treating a single exposure individually by older methods.

It may be of interest to review briefly how these measures work:

On the power side, noise-frequency influence, a measure of the noise-originating ability, is a function of the audio (i.e., harmonic) frequency voltages and currents on the power line, and is controlled by controlling these audio-frequency components. While the 60-cycle currents and voltages are of interest from some standpoints—for example, induction into telegraph circuits, bell tapping on grounded ringing telephone circuits, etc.—it is the harmonics that are important from the noise standpoint.

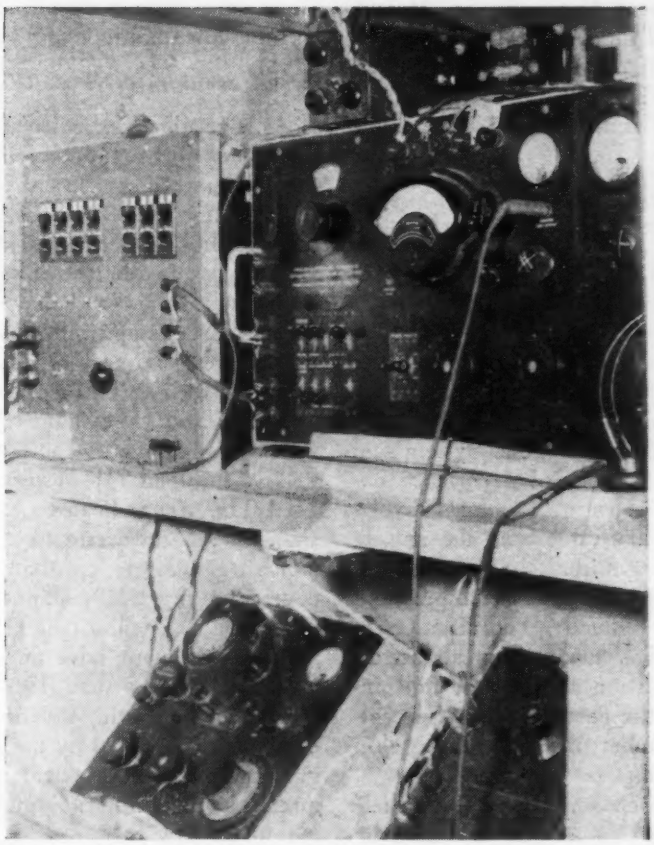


FIG. 2—Noise measuring equipment mounted in truck directly behind driver's seat for ready use in making tests along power and telephone lines

They must be considered as separate and apart from the 60-cycle components; in fact, the noise influence of a rural power circuit is usually highest when the 60-cycle load is the lowest, and vice versa. The only reason why 60-cycle components need to be considered at all from the noise standpoint is that we have not yet learned how to design devices which will be effective at harmonic frequencies and yet have no effect at 60 cycles. However, it is usually possible to devise arrangements which do not adversely affect power operation; sometimes they actually improve it.

Balance for Susceptiveness

On the telephone side, susceptiveness, a measure of the noise-receiving ability, is largely a matter of balancing the circuit impedances in the lines, central office equipment and subscriber stations. On the line, this means a reasonable degree of freedom from leaks due to foliage contacts and missing or faulty insulators. Good wire joints, and relatively frequent transpositions, are required. In the central office, it means good balance of the impedances between the two wires of the circuit and ground. At the subscribers' stations, the problem usually is to limit the effect of the ringer-to-ground connections on grounded ringing lines.

It is true that, if the power system influence could be made vanishingly small, there would be very little noise on any kind of paralleling telephone circuits—even ground return; as a matter of fact, in rare cases influence can be reduced close to this point. It is also true that if the telephone susceptiveness could be made infinitesimal by perfectly balancing the telephone circuits, they would be immune to noise induction from parallel power circuits regardless of power line influence; in rare cases, this condition can be approached. But, by and large, the best results and the lowest costs to the public are secured when *both* the influence of the power systems and susceptiveness of the telephone circuits are kept reasonably low; it is by this process that the long record of satisfactory solutions to noise problems has been secured.

The technical phases of this matter are described in more detail in a paper presented before the 1941 winter convention of the American Institute

of Electrical Engineers by Messrs. Smith and Plucknett of the REA and Mr. Taylor of the A.T. & T. Co. and published in *AIEE Transactions Supplement*, Vol. 60, pages 586-595, June 1941.

Year of Joint Effort

One of the primary reasons why REA-Bell System jobs can be handled efficiency and economically is the wealth of information provided through the years of work of the Joint Subcommittee on Development and Research of the Edison Electric Institute and Bell Telephone System and the large amount of experience obtained in operating problems involving the Bell System and the private Power companies.

With such a sound base to grow on, the art of inductive coordination in this field has advanced in almost direct proportion to the four-fold increase in the past decade in percentage of number of farms having electric service.

Pictures accompanying this article show some of the test equipment used in these investigations.

Manufacturers Enlisted

As a result of experience in these and other investigations, REA engineers are working closely with electrical manufacturers to secure relatively small alternators which generate voltages practically free of harmonics. Some interesting results have been secured; for example, three machines under 1,000 kva. each have been purchased which have an open-circuit voltage TIF (Telephone Influence Factor) of about 2.5 and a non-inductive full load TIF of very close to 1. A TIF of 1 indicates a pure wave shape with no harmonics present. Not all generators are that good, of course, but practically all of the newer ones have an open circuit TIF of less than 15 and many have an open circuit TIF of less than 10.

Another interesting line of development being followed by the REA engineers with the electrical manufacturers, is the limitation of harmonics in the magnetizing currents of distribution transformers. It is contemplated that the newer transformers will have a magnetizing I·T product (i.e., product of magnitude and TIF of magnetizing current) per kva. measured on the 120-volt windings of less than 15, and at the same time have low core losses. The low I·T characterictic is important because of the large numbers of transformers on individual systems of REA borrowers, while the low core loss is required because of the relatively large ratio of connected kva. capacity of the distribution transformers to average load.

Low-Resistance Joints

A number of improvements in the over-all susceptiveness conditions on Bell System circuits have also been made in recent years. The increasing use of "rolled" or "compression" sleeves is rapidly doing away with the occasional high resistance joint that had been a major source of unbalances for many years. The newer central office equipment has much smaller unbalances than some of the earlier types. The unbalances of the newer types of party-line station sets have also been reduced. Improvements in telephone transposition systems are expected to reduce direct metallic circuit induction.

Future Cooperation

When manpower and materials again become available, it is expected that many thousands of miles of rural power and telephone lines will be built—and thousands of miles of exposures will be created. Obviously, if we were to attempt to care for the resulting inductive coordination problems by studying and applying measures on a specific exposure basis, the way would be hard, indeed. But with the experience we already have, we are certain that if, on the power side, the harmonics are adequately controlled on an *over-all system* basis, and, on the telephone side, unbalances are adequately controlled on an *over-all system* basis, there will be very few situations where anything further needs to be done. To accomplish this, it will be necessary to work closely together and to make effective use of all developments in the coordination art; however, this is a procedure which comes naturally to coordination engineers.

FIG. 3 and 4—Portable noise-measuring sets in use. The bushings on the side of the truck are used for connecting current and potential transformer leads to the switchboard on the left in Fig. 2. (Bottom) Close-up view of the instruments

Buffer Reactor Limits Arc Furnace Flicker

Substantiation given for choice of 2,000-kva. condenser in conjunction with variable buffer reactor to restrain flicker effects of 1,500-kw. arc furnace—Calculation of maximum power—Condenser supplies bulk of reactive—Bus voltage stabilized

J. M. HARKINS, The Hydro-Electric Power Commission of Ontario, Toronto

GREAT EXTENSION in the use of electric arc furnaces during war-time has brought into prominence the problem of correcting or minimizing voltage fluctuations induced by their operation. In severe cases, where the capacity of the furnace is large relatively to the capacity of the system supplying it, use is often made of a buffer reactor in the supply line in combination with a synchronous condenser on the furnace bus. The purpose of the reactance is to allow the voltage of the furnace bus to fall sufficiently to allow the condenser to pour in lagging kilovars and so avoid a heavy draft of reactive from the system.

The purpose of this paper is to outline a method for the selection of the most suitable values for the condenser and furnace transformer reactance, having regard to the power requirements of the furnace and to the voltage fluctuation produced at the supply bus.

Typical Example

We will take as an example a 1,500-kw. furnace recently installed, which is supplied by a 2,000-kva. furnace transformer having a variable reactance up to 40 percent on rating. A variable buffer reactor having reactance taps up to 35 percent on its 2,000-kva rating is inserted between the supply line and the condenser bus. A 2,000-kva. synchronous condenser with a transient reactance of 25.8 percent is installed for the purpose of maintaining the voltage on the load side of the buffer reactor.

There are two distinct conditions of operation for which calculation is to be made:

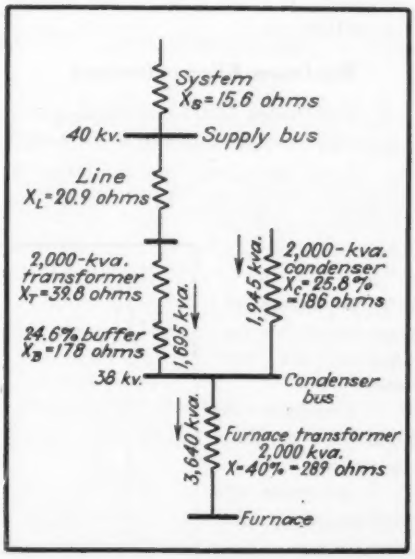


FIG. 1—Reactance diagram for furnace transformer, synchronous condenser and buffer reactance

1. Electrodes arcing — Maximum *power* being delivered to furnace. Calculate maximum power which can be delivered to furnace with different values of furnace reactance. Also calculate capacity of condenser necessary to maintain condenser bus voltage under these power deliveries.

2. Electrodes shorted — Maximum *current* being delivered to furnace. Calculate voltage fluctuation at supply bus for various furnace reactors and condensers.

Maximum Power Demand

1. *Electrodes arcing*—For this condition it is desired to calculate the maximum power in kilowatts which can be delivered to the furnace at 90 percent power factor for each value of furnace transformer reactance. For each value of furnace transformer reactance there is a definite power limit beyond which it is not possible to deliver kilowatts to the arc even if the voltage on the high voltage side of the furnace transformer is held absolutely constant and no matter how close the electrodes are brought to the metal bath. This power limit is, of course, increased as the reactance of the furnace transformer is reduced and its value is determined by the formula:

$$\text{Max. power (Kw.)} = \frac{500\ E_s^2 \cos\phi}{X\ (1 + \sin\phi)}$$

where E_s = line-to-line voltage in kilovolts

X = reactance of furnace transformer in ohms

ϕ = power factor angle of furnace load

Or expressing the furnace transformer reactance in terms of percentage and capacity, the formula is:

$$\text{Max. power} = \frac{50 \cos\phi \text{ kva.}}{\%\text{ reactance } (1 + \sin\phi)}$$

where kva. is rating of furnace transformer.

Assuming a power factor of 90 percent at the furnace transformer low voltage terminals, we obtain the following schedule giving the maximum power for each value of furnace reactance.

From the table, it is apparent that

Percent Reactance of Furnace Transformer	Maximum Power at 90 Percent P. F.
40	1,570
35	1,795
30	2,100
25	2,520
20	3,140
15	4,190
10	6,280

the full rated power of 1,500 kw., can be delivered with any reactance of 40 percent or below.

Kilovars from Condenser

During this condition of operation, the condenser must supply the kilovar demand of the furnace plus the I^2X loss in the furnace reactance and must in addition supply sufficient reactive to the line to maintain the rated voltage on the high voltage terminals of the furnace transformer. The total of this demand on the condenser can be calculated (Fig. 2) for each value of furnace reactor and for varying values of furnace load.

Each point on each curve was obtained by going through the following steps:

(a) Determine rkva. demand of furnace at the selected load, assuming 90 percent power factor at the arc terminals.

(b) Calculate I^2X loss in the furnace transformer for the selected value of load and reactance.

(c) Determine value of rkva. required to hold voltage on condenser bus using circle diagram of line, step-down transformer and buffer reactor.

(d) Add (a), (b) and (c) to determine demand in condenser for the conditions assumed.

Reactance Range

It will be noted that these curves confirm the conclusion arrived at by calculation that 1,500 kw. could be delivered to the furnace only if a furnace reactance of 40 percent or lower is used. With this load and reactance the condenser will be called on for 2,500 rkva. continuously. Accordingly, if this high reactance is used in the interests of reducing short circuit currents and the maximum power of 1,500 kw. is required during the time that this high reactance is used, the minimum thermal rating for the condenser would be 2,000 to 2,500 kva. As it is not essential that the condenser bus voltage be held constant from no load to full load, the smaller size was decided upon as sufficient for load carrying purposes. The question of whether this capacity would be adequate for counteracting voltage fluctuations at the supply bus during short circuit conditions is dealt with in the following section.

Maximum Kilovar Demand

2. *Electrodes short circuited*—This condition occurs when the electrodes are short circuited, particularly at the start of the run. At this time, no power is delivered to the arc and the current is limited only by the reactance of the supply circuit.

In order to prevent these heavy current surges from causing voltage fluctuations on the supply bus, a furnace reactor is used of as high a value as possible consistent with the maximum power requirements outlined above. In addition a buffer reactor and condenser are used in an attempt to supply most of the current from the condenser and so lower the sudden demand on the supply bus.

These elements, together with the supplying system, represent a simple network (Fig. 1). One branch of this network represents the equivalent reactance of the supply system up to the condenser bus including the "buffer reactor." The second branch is made up of the equivalent reactance of the synchronous condenser. The third branch represents the furnace transformer and its reactor.

If a short circuit occurs at the furnace terminals the proportion of

FIG. 3—Curves of maximum flicker for 1,500-kw. arc furnace
X_F = reactance of 2,000-kva. furnace transformer
X_B = reactance of 2,000-kva. buffer reactor
Transient reactance of 2,000-kva. synchronous condenser assumed 25.8 percent

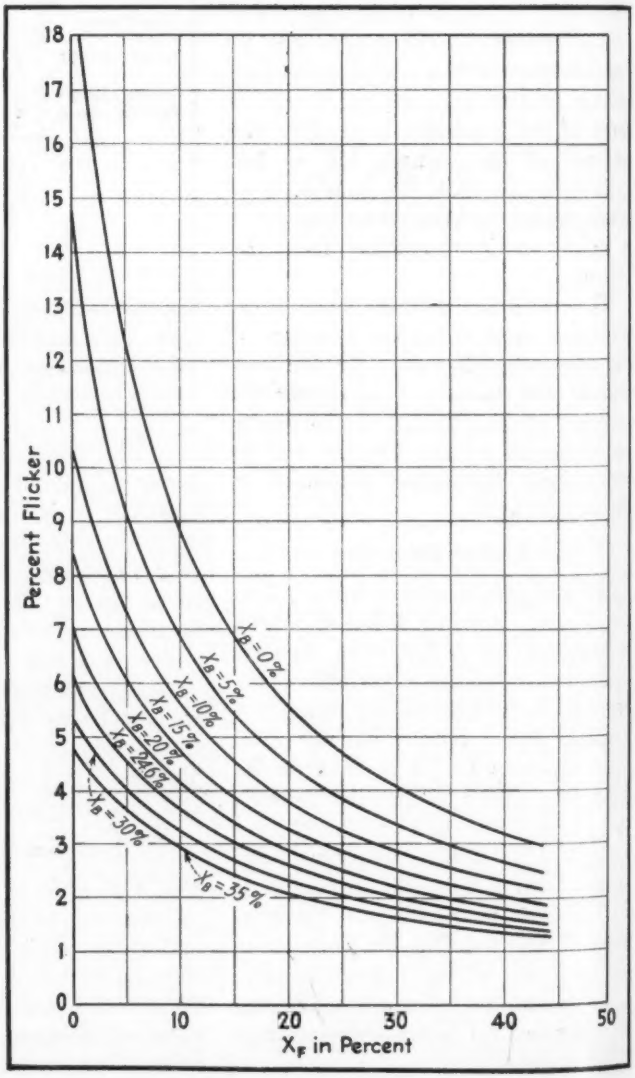
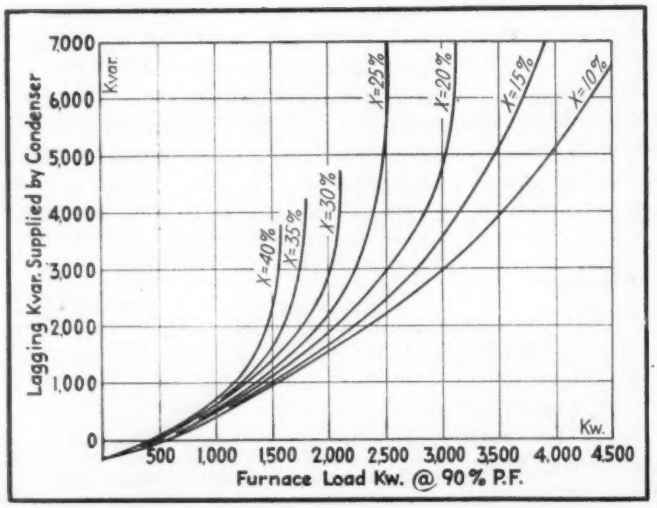


FIG. 2—Kilovars required from condenser with 24.6 percent buffer reactance and various values of reactance in furnace transformer



current in each branch is determined by the usual methods of short circuit calculation. Fig. 1 shows a typical flow. Note that most of the current is supplied by the condenser branch.

Range of Flicker

Having determined the current drawn from the main system, it is possible to calculate the voltage drop resulting at the supply bus by multiplying the current delivery by the equivalent system impedance to that point.

In Fig 3 is shown a series of curves indicating the calculated voltage drop at the supply bus for different values of condenser, buffer reactor, and furnace reactor. The points on this curve were individually calculated by the above method.

It is apparent that with a 24.6 percent buffer reactor and a 2,000-kva. condenser, furnace reactances of 30 percent more result in voltage fluctuations on the supply bus of less than the required 2 percent. As the required power flow of 1,500 kw. can be obtained with furnace reactances of this value, as explained in the previous section, the required condenser rating of 2,000 kva. appears to be confirmed.

After completion of the particular installation under discussion, tests of flicker were carried out and the results confirmed in general the predicted values. The accurate measurement of instantaneous flicker requires special apparatus preferably of the electronic type and until this is available it will not be possible to make an accurate check as between calculation and actual results. However, test results obtained by observing the deflection of a voltmeter needle show that the calculated flicker is accurate within approximately one percent, which is within the limit of error of the method of observation used.

• • •

Mechanical and Electrical Separation at Huntley

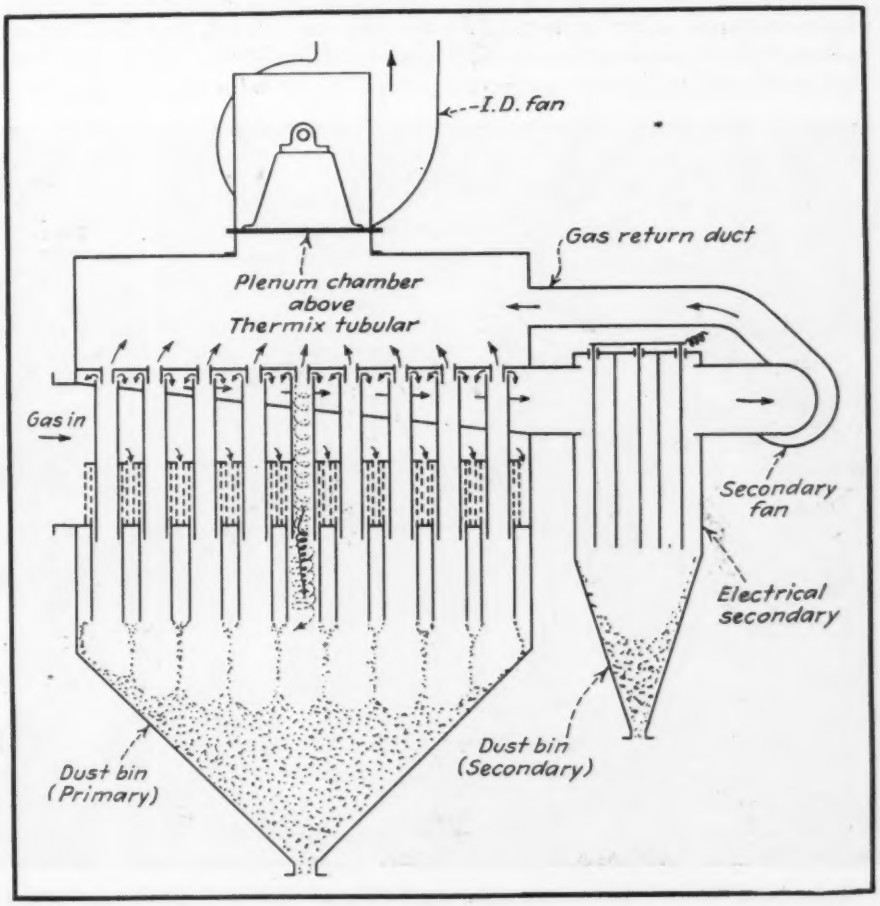
C. F. WAGNER*
Manager, Central Station Engineering, Westinghouse Electric Corp., East Pittsburgh, Pa.

An application of electrostatic precipitation of great potentiality in the central station field is the removal of fly ash from stack gases. As a result of the researches of the Prat-Daniel Corp. and the Westinghouse Electric Corp. a duplex unit consisting of a mechanical precipitator and an electrical precipitator has been developed and operated.

A pilot installation has been installed at the Huntley station of the Buffalo-Niagara Electric Corp. This unit is intended to handle one-quarter of the 900,000 pound per hour generating unit.

General arrangement of the duplex unit is shown in the sketch. Flue gases enter the periphery of the separator and are given a high rotative velocity or cyclonic effect. The heavier particles strike the wall of the tube and drop to the bottom of the primary dust bin. The flue gas then rises through the tube with a continued vortex action. The greater portion of the remaining dust is skimmed off through the upper annular slot to the electrical precipitator, the inner volume of the gas being carried off to the stack.

Tests have shown that the efficiency of the Thermix tubular collector is about 80 percent so that this portion of the dust content drops into the dust bin primary and the rest of the dust rises through the upper portion of the tube. If it is assumed that the collector at the top catches three quarters of the remaining dust then approximately 15 percent of the original dust content is drained off to the electrical precipitator. Efficiency of the Precipitron for the smaller particles which still remain is in the order of 95 percent. Thus nearly all of the dust going to the Precipitron is collected in the dust bin secondary. Overall efficiency of collection is thus approximately 95 percent of the original dust content.



SCHEMATIC PRINCIPLE of duplex stack-ash collector

* Excerpt from recent paper to Montreal Branch meeting of A.I.E.E.

Combination Digger-Line Truck Proves Economical Utility Tool

Modern general-duty line trucks equipped with earth boring machines meet needs of system where special digger trucks are not justified—Combination trucks have short wheel-base and special performance characteristics required for digger duty

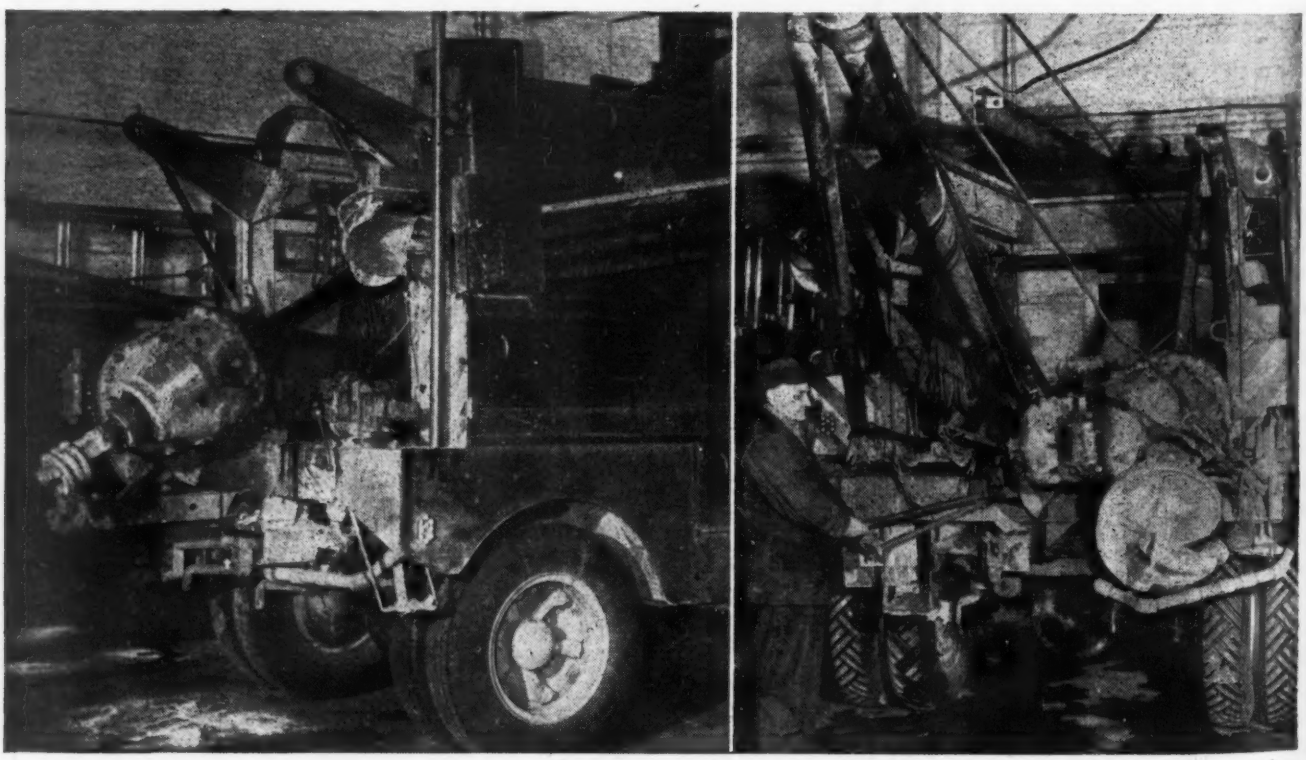
PAUL BARDEEN, Wisconsin Gas & Electric Co., Racine, Wis.

THE UNIQUE CONCEPT of a general-duty truck that incorporates both the special equipment and performance characteristics of a "digger" truck has been realized in three trucks in general line service on the Wisconsin Gas & Electric system for the past three years.

Development of these combination "digger-line trucks" stemmed directly from characteristics of this rather widely scattered utility system. All but one of the four divisions had sufficient pole work to justify a special digger truck. In the division, where work was sufficient in volume, distances were great and as a result truck and crew travel time for separate digger and line trucks was prohibitive.

It was found, however, that for a relatively small increase in first cost earth boring equipment could be provided on a new line truck thus reducing operating costs and making effective use of manpower. Study revealed that the earth borer, as a tool, could be justified economically if used for as few as 10 holes per month.

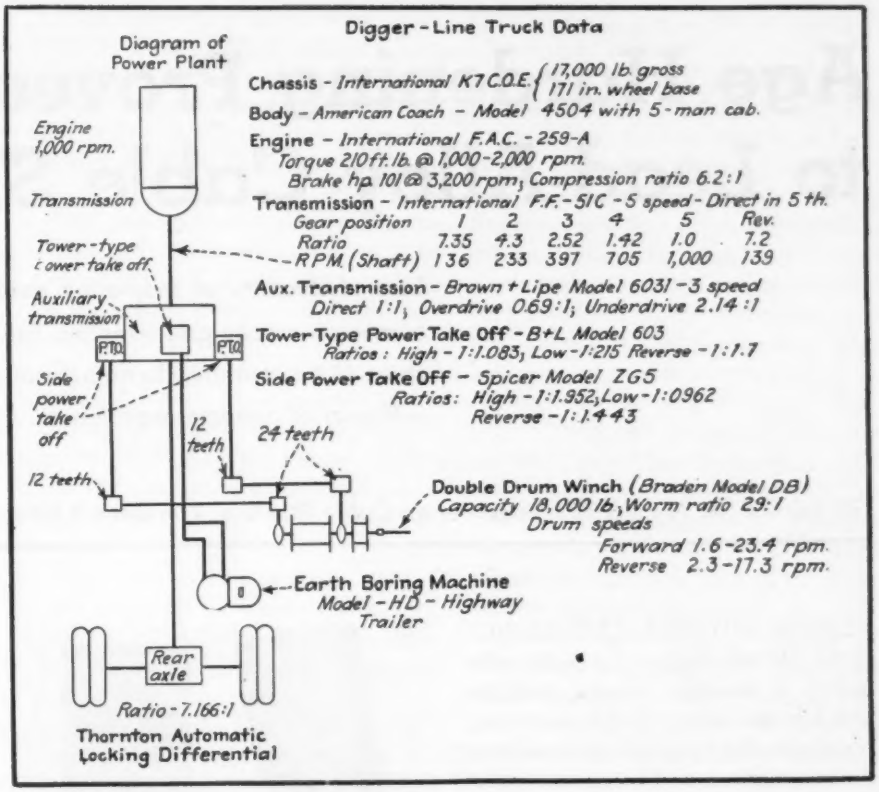
Having made the decision to use a combination digger-line truck several factors in the selection of the truck and body were fixed. A cab-over-engine (C.O.E.) type body was indicated to give the necessary short wheel base (117 in.) for maneuverability in cramped quarters. To have used a conventional truck with a 117-in. wheel base would have cut about 30 in. from the body length making the cab-axle distance shorter than that of the C.O.E. type. Dimensions of a C.O.E. line truck with and without



TELESCOPING PINTLE (left) visible under digger, permits truck to negotiate turns with pole trailer without interference with boring machine. Note short overhang of rear of truck. Digger, model T-45 derrick, double-drum winch (right) are provided on truck

digger compare with similar conventional trucks as outlined in the table. Notice that the need for reducing overhang on the rear of the digger-line truck has reduced its overall length compared with the regular C.O.E. While a body length of 156 in. is desirable it was necessary to compromise at 114 in. with the digger on a 117-in. wheel base truck. Future designs may consider lengthening the wheel base to give less obstructed body space.

An auxiliary transmission with three power take-offs was required to drive the double-drum winch and digger, give maximum speed adjustment on the winch and digger equipment as well as a desirable combination of road speeds. Since travel time is expensive it was desirable to have the truck move along the road with traffic and yet have ample torque at low speed for pulling heavy loads and off-the-road service. These were the general objectives for the power system.


Digger-Line Truck Data
Diagram of Power Plant
Chassis - International K7 C.O.E. { 17,000 lb. gross / 171 in. wheel base
Body - American Coach - Model 4504 with 5-man cab.
Engine - International F.A.C. - 259-A
Torque 210 ft. lb. @ 1,000-2,000 rpm.
Brake hp. 101 @ 3,200 rpm; Compression ratio 6.2:1
Transmission - International F.F.-51C - 5 speed - Direct in 5th.
Gear position 1 2 3 4 5 Rev.
Ratio 7.35 4.3 2.52 1.42 1.0 7.2
R.P.M. (Shaft) 136 233 397 705 1,000 139
Aux. Transmission - Brown+Lipe Model 6031 - 3 speed
Direct 1:1; Overdrive 0.69:1; Underdrive 2.14:1
Tower Type Power Take Off - B+L Model 603
Ratios: High - 1:1.083; Low - 1:215 Reverse - 1:1.7
Side Power Take Off - Spicer Model ZG5
Ratios: High - 1:1.952, Low - 1:0962
Reverse - 1:1.443
Engine 1,000 rpm.
Transmission
Tower-type power take off
Auxiliary transmission
P.T.O.
P.T.O.
Side power take off
12 teeth
24 teeth
12 teeth
Double Drum Winch (Braden Model DB)
Capacity 18,000 lb; Worm ratio 29:1
Drum speeds
Forward 1.6-23.4 rpm.
Reverse 2.3-17.3 rpm.
Earth Boring Machine
Model - HD - Highway Trailer
Rear axle
Ratio - 7.166:1
Thornton Automatic Locking Differential

DIGGER-LINE TRUCK power system data outlined

Power Take-off

A common method of driving a digger is to use a split-shaft power take-off thus providing all gear ratios of the truck transmission for the digger and delivering, at the same time, the necessary full load torque of the engine. However, extra torque was desired on the rear wheels to pull the truck out of ditches or holes with only two driving wheels. This requirement also favored the three-speed auxiliary transmission. Two side power take-offs (one for each winch drum) were provided with a full-torque tower-type power take-off used for the digger. To help in pulling heavy loads in mud or ice, where only one of the two driving wheels have traction, a Thornton automatic locking differential was also provided. This device, giving further approach to "good" operation, automatically locks out the wheel that "spins" and applies full torque to the wheel having traction. A total of 16 other company trucks have been so equipped.

Besides the earth boring machine (32-in. auger, 13-ft. rack bar) the truck is equipped with a model T-45 derrick and five-man cab with caboscope. This latter device in the roof of the truck cab permits the driver to observe the progress of a load on the derrick without leaning from the cab.

The combination digger-line truck has some disadvantages which must be accepted with its advantages. The necessity for carrying digging as well as line tools, and the presence of the digger somewhat restricts the length and number of side compartments. The digger also leaves less unobstructed space in the body of the truck particularly when the derrick is raised. On the whole, however, these disadvantages are not serious enough to overbalance the very great efficiency advantages accruing from having a dagger available on a line truck.

Truck	Body Length—In.	Cab-Axle Distance—In.	Overall Length—Ft.	Wheel Base
C.O.E. (No digger)	156	75	19	117
C.O.E. (Digger)	114	75	17¾	117
Conventional	132	84	21	158

COMBINATION DIGGER-LINE TRUCK with five-man cab proves effective where special digger truck is not justified economically

Age Hardening Proves Fatal to Lead-Alloy Cable Sheath*

Loss of ductility of lead-alloy cable sheath leads to development of numerous cracks and eventual failure upon reinstallation—Bend tests show 40 percent drop in number of 90 degree bends possible after year —Report of adverse experience on system of Detroit utility

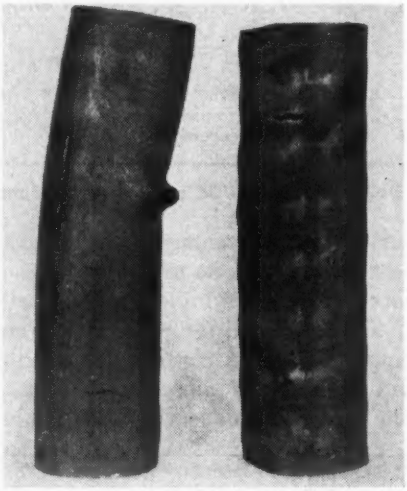
GORDON B. McCABE, Engineer on Cable Practice, The Detroit Edison Co., Detroit, Mich.

RECENT ADVERSE EXPERIENCE of the Detroit Edison Co. with cable having a lead-alloy sheath, indicates that age-hardening of this sheathing, containing the proportions of calcium, tin, magnesium and bismuth used in 1939 and 1940 cables, so reduces ductility that any reinstallations of such cable would undoubtedly result in intercrystalline cracking of the sheath and eventual cable failure.

Further investigations indicate, however, that lead-calcium cable sheaths containing 0.025 to 0.030 percent calcium, will withstand at least two additional installations and removals without affecting the integrity of the cable covering. Our metallurgist believes, however, that the calcium content could be reduced further to 0.020 percent and improve the important property of ductility without significant reduction in tensile strength† and resistance to creep, fatigue and abrasion.

Early Development

History of the use of lead-calcium alloys for cable sheaths extend back to the 1920's when an alloy of 0.03 to 0.04 percent calcium and lead was developed by one of the telephone cable manufacturers which showed superior resistance to fatigue, tension and abrasion. A number of installations of cables sheathed with this alloy were made on Bell systems throughout the country in the thirties.



TWO SECTIONS of lead-alloy cable sheath removed from 24-kv. cable that failed after one reinstallation. Note cracks in both sections

Subsequently, in the late thirties one of the ore refineries produced Alloy B, an alloy composed of lead, calcium, magnesium, tin and bismuth for which high tensile strength, creep resistance, fatigue resistance, corrosion resistance, abrasion resistance and stability were claimed.

These advantages pointed toward the possibility of thinner cable sheaths having performance equal to or better than standard common lead sheathing, or cables covered with the same thickness of Alloy B which would withstand higher internal pressures without bursting. Such cables could last longer under vibration, as in the case of cables on bridges and subways, and under repeated bending caused by daily and seasonal temperature changes due to loading cycles.

Trial Installations

About 1939 Detroit Edison Co. placed orders for 10,000 ft. of hard-sheath cable; about 7,000 ft. of lead-calcium alloy, and about 3,000 ft. with Alloy B sheathing. The lead-calcium alloy contained 0.025 to 0.030 percent, by weight, of calcium in accordance with the 0.027 (plus or minus 0.005) recommended by one of the telephone cable manufacturers. The Alloy B comprised 0.019 to 0.020 calcium, 0.011 to 0.015 magnesium, 0.25 tin and 0.015 to 0.020 bismuth.

These cables, which were three 350,000 cir. mil shielded conductor 24-kv. cables, were installed in various parts of the system in order to obtain operating experience under a variety of conditions; on aerial cable construction, on the feed from a base-load generator to a switching station and in cable lines subjected to heavy load cycles.

Trouble Experienced

The length of cable on which trouble was experienced was a piece of Alloy B sheathed cable which had been installed as one of nine cables in the feed of a 75,000-kw. generator to a switching station about 2,000 ft. distant. It operated for two and one-quarter years but in January 1943 was removed on suspicion of having a high power factor at a point where coal had unwittingly been piled over the conduit run.

Inspection of the installation here did not uncover enough evidence to

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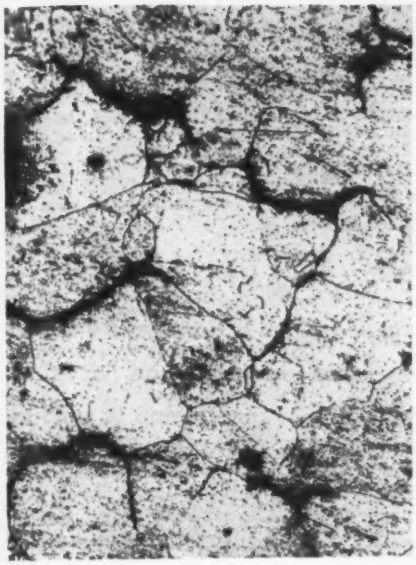
* Based on paper before joint meeting of Underground group EEI and cable engineering section AEIC May 14, 1945, at Cincinnati, Ohio.

† See Fig. 8, "Age Hardening Lead-Calcium Alloys" by E. E. Schumacher and G. M. Bouton, Bell Telephone Laboratories Reprint B-467, April, 1930.



INTERCRYSTALLINE cracks in lead-alloy cable sheath section

warrant keeping the length out of service. Accordingly, the longest piece remaining was installed in February 1944 on a 24-kv. trunk line where it operated for six months from July 1944 to January 1945 when it failed due to moisture entering through a defective sheath containing numerous cracks.

First inspection showed two circumferential cracks a few feet apart near the fault. It was obvious that a similar crack had occurred at the fault during or after its last installation, permitting the entry of water and producing failure.

As the cable was wound onto the take-up reel, further stress points developed which cracked open when the cable was transferred to another reel in taking samples. Innumerable hairline cracks also showed up along practically the whole length.

Test Findings

Laboratory examination of sheath sections indicated that failure was due to age-hardening with resultant loss of ductility, as manifested by a marked intercrystalline brittleness and a decrease in bending strength. Numerous intercrystalline cracks were observed at both the outer and inner surfaces of the samples. These intercrystalline cracks are visible in the photomicrograph shown.

Manufacturers' test data received shortly after the calcium-lead and Alloy B sheathed cables were produced are of interest in showing the change in physical properties with time.

Accompanying curves show that Alloy B sheath has a relatively low tensile strength of about 2,100 to 2,400 psi. for an appreciable period after extrusion and does not attain the value of 4,000 psi. which is typical of this alloy for over a year.

The lead-calcium alloy, on the other hand, starts out with a value of about 3,000 psi. upon extrusion and attains values in excess of 3,500 psi. inside of 20 days.

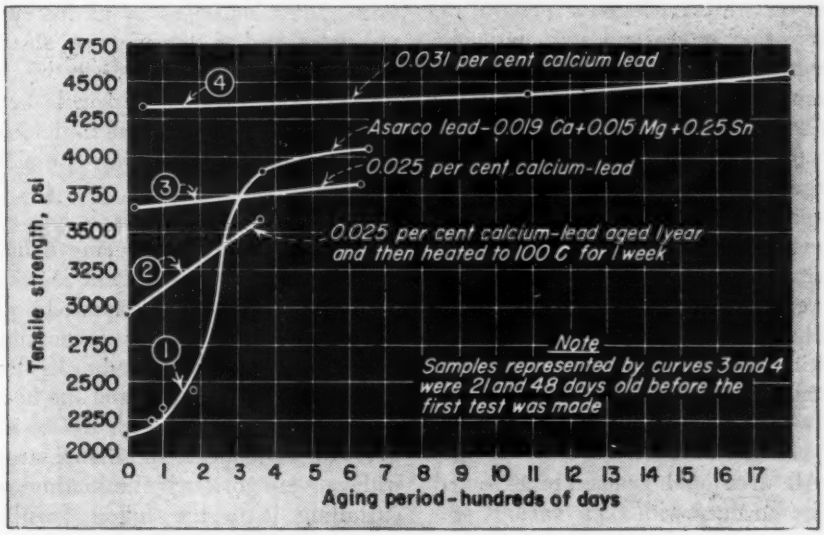
Bending tests also show the rapid change that took place in less than a year, in the Alloy B sheath. The number of 90-deg. bends before failure occurred decreased from 29 to 17, a drop of over 40 percent in a period of a year.

The lead-calcium sheath showed much more uniform values with age; the number of bends changing from 20 to 19, a drop of only 5 percent. The number of 90-deg. bends for common lead is usually more than twice these values.

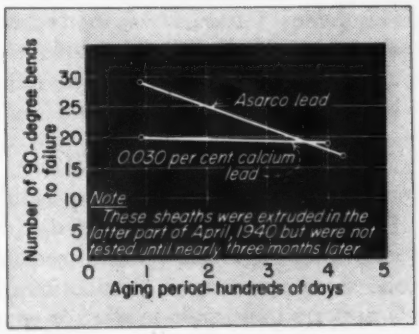
This rapid drop in the bend test curve might have served to foretell the age-hardening of Alloy B sheath and resultant troubles due to loss of ductility. Bend tests made on specimens of the failed sheath showed as few as two 90-deg. bends to develop the first crack and as low as 12 bends to complete failure.

Anticipating that similar intercrystalline cracking might have occurred in the field on lengths of lead-alloy sheathed cables, inspections were conducted on a number of the lines containing Alloy B sheathed cables, particularly near the points of stress from expansion and contraction such as offsets in the manholes, near the joints in aerial cables, etc. One instance, in which a crack was developed all the way thru and halfway around the periphery, was uncovered in an Alloy B sheathed serial cable alongside a dummy sleeve. The sleeve had been installed in repairing the sheath which had worn through where an expansion loop of the cable rubbed against the pole.

In order to determine the behavior of the lead-calcium alloy sheathing under conditions similar to those producing fractures in Alloy B sheath, a reel of lead-calcium alloy sheathed cable that had been installed and operated for two and one quarter years and later removed from the duct, was subjected to re-reeling twice at the cable plant. No evidence whatsoever of even surface checking of the sheath was found.


Tensile strength, psi
4750
4500
4250
4000
3750
3500
3250
3000
2750
2500
2250
2000
0.031 per cent calcium lead
Asarco lead-0.019 Ca+0.015 Mg+0.25 Sn
0.025 per cent calcium-lead
0.025 per cent calcium-lead aged 1 year and then heated to 100 C for 1 week
Note
Samples represented by curves 3 and 4 were 21 and 48 days old before the first test was made
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Aging period-hundreds of days

TENSILE STRENGTH of Alloy B lead increased from 2,100 to 4,000 psi. in about one year



DECREASE FROM 29 to 17 in number of 90-deg. bends to failure in year's time reflects loss of ductility of lead alloy due to age hardening

How a Distribution Department Is Organized

Administrative set-up and responsibility details of a dominantly urban utility's distribution department—Work-hours, identification, accident reporting, purchasing, decisions on irregularities, supervision of instruction covered—Staff members' duties outlined in ensuing issues

IN ORGANIZING utility departmental set-ups for maximum effectiveness clear definition of divisional heads' responsibilities is an aid to the conduct of affairs. Although local conditions are bound to cause variations in these personnel specifications when set forth in diagrams or print for the guidance of employees, the manner in which particular companies work out these listed objectives may be of wide suggestiveness. Therefore in the following paragraphs are presented the general organization set-up and staff authority diagram for the distribution department of a power company serving 61,225 electric meters and a territory of 63.4 sq. mi., the service being largely urban and the management responsive to highly clarified definitions of personnel duties. The initial installment of this material covers the general duties of divisional heads, to be followed by other installments stating the specific duties of these staff members.

Hours of Duty Named

All divisional heads are expected to be on duty with their various sections on all regular business days during the hours stated below and to be present at some definite place on the premises at the opening and closing of business each day. These hours apply from Monday to Friday inclusive, and run from 8 a.m. to noon, and from 1 p.m. to 5 p.m., with the exception of the general line foreman and electrical construction foreman, who are on duty from 7:30 a.m. to noon and 1 p.m. to 4:30 p.m., and a joint line representative (dealing with foreign utilities' pole occupancy, in the main) whose hours are 8 a.m. to 1 p.m., and 2 p.m. to 5 p.m.

When a divisional head wishes to be absent he is required to obtain permission from the superintendent of distribution, and when absent from his office on company business he is expected when possible to leave word as to where he can be found and when he expects to return. Each divisional head is responsible for the observation of regular hours by all his subordinates and that none are absent without permission. A report of the time worked by each person is kept by him, by foremen or the individual employee with all entries complete in every detail.

If a salaried employee is present for a reasonable time during a half day he is reported as present for that half day. Every effort is made by divisional heads to as far as possible eliminate overtime by subordinates. When such work is planned the head is required to confer with the assistant superintendent of distribution with a view toward eliminating or curtailing it to the fullest feasible extent. Each divisional head arranges before May 1 a yearly vacation schedule for himself and eligible employees, avoiding having an excessive number absent at one time.

Divisional Responsibility

Divisional heads are responsible for all work under their jurisdiction according to instructions issued by the superintendent of distribution. If it appears impossible to start or complete periodic or special work on the day specified, or to do it in the manner required, the divisional head is required to inform the superintendent of distribution sufficiently in advance of the date set for completion to permit such action to be taken as will finish the work on time.

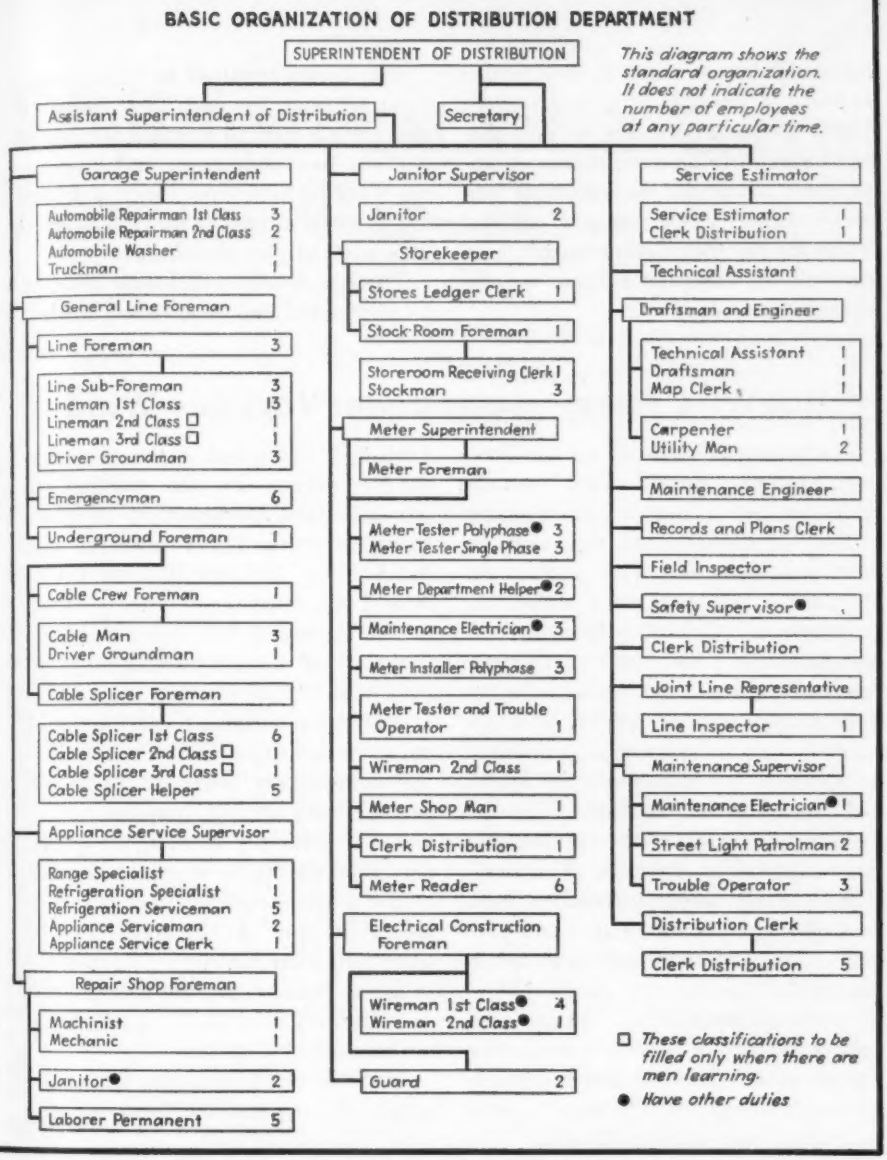
Identification Card Checks

Every divisional head whose men come in contact with customers sees to it that each man is provided with an identification card properly signed and sealed. Passes for admission to restricted areas are issued to men selected by the superintendent. On the first full working days of January, April, July and October each divisional head personally inspects all identification cards and passes which have been issued to their subordinates. Such heads are required to collect and turn in to the assistant superintendent of distribution all instructions, identification cards, passes and company keys from persons who have ceased to be company employees.

Service recorder charts from automobiles are sent to the head of the division to which the machine is assigned, and the signature of the division head on the chart is considered his approval for the indicated use of the machine.

Accident Reports

All accidents are reported on forms by the men involved under the heading "Instructions to Drivers," divisional heads seeing that these are properly filled and turned over to the superintendent of distribution. A book re-



BASIC ORGANIZATION DIAGRAM of staff responsibilities and number of men normally required by power system distribution department supplying about 61,000 meters and covering about 64 sq. mi. of territory. Bulk of customers urban or suburban. The number of men required varies somewhat from time to time from the data shown

cording the details of unusual troubles on the system also carries among other reports of operation data upon fatal or serious accidents to any person. Besides reporting to the superintendent of distribution all accidents, large or small, divisional heads are required to report to him certain types of "near" accidents. An example of the kind that is reported would be a case where supposedly dead wires have been found alive after they have been cut into or worked upon; and another would be a violation of tagging rules even though no harm resulted. Near accidents are not reported on regular report blanks but are covered either verbally or in writing to the person responsible for the operations of the men.

The superintendent of distribution may investigate near accidents in the same manner as actual ones, and employees responsible for them are required to appear before the company's safety committee just as though an actual accident had taken place.

Property Damage

All cases of property damage such as broken windows, doors or other building damage, damage to automobiles which would not be the subject of an automobile accident report, damage to instruments, machines, etc., which occur in connection with company operations and are not covered by some other accident report are required to be immediately reported by the man responsible for the damage on a form for the purpose, and turned in to the division head, who signs it and delivers it to the office of the superintendent.

Outside Negotiations

All correspondence either outgoing or incoming with outside concerns upon other than routine subjects and upon all routine subjects which are a matter of record are required to pass through the hands of the superintendent, except that all letters having to do with the purchasing, acceptance or rejection of materials or other similar matters are handled in the stores division. Division heads are required immediately to notify the superintendent of distribution of any negotiations they have with large power customers in order that he may contact the power sales department or instruct someone to do so. Such negotiations include changes in wiring on customers' premises, proposed new service entrances, new connections or any dealings whatever including any relations between the meter division and such customers except routine matters like meter reading and meter testing. Division heads consult with the superintendent before making contact with the customer or his representative.

All bills except for the purchase of materials regularly kept in stock or for other minor purchases are submitted to the superintendent, who may pass them on to various division heads for approval. Division heads after acting on such bills return them to the superintendent's secretary.

Control of Material Orders

Payment is made of expenses incurred for lunches, telephone calls, etc., only on requisitions approved by the superintendent. Division heads are required to make out such requisitions and present them to the superintendent for approval. These state in each case what the money was expended for, and why, and are presented within a week of disbursement. Division heads are required to sign material issued tickets for all supplies drawn from stores by their subordinates. Except in emergency or under very unusual conditions such tickets have to be signed before material is drawn. Local orders may be used by division heads to buy appliance repair parts or other material carried in stock by local merchants

when the value of the purchase is small. Such orders are required to carry the signature of the assistant superintendent of distribution. The garage superintendent, storekeeper and repair shop foreman may sign local orders which they make out for materials which they need, sending a copy to headquarters. All other materials are required to be ordered from the system's central purchasing department, either by a divisional head's supply requisition or memorandum to the distribution department secretary to requisition.

Current Diversion Discoveries

Any divisional head having knowledge of a diversion of current is required to immediately report it to the meter superintendent or meter foreman. Divisional heads are also responsible for keys to customer's premises handled by their divisions, and their proper return after use. All meter service orders calling for work necessitating use of a customer's key must be plainly marked "Key" by the department in which they originate.

When a work order is issued to any division, its head becomes responsible for the ordering of any special materials or equipment needed, and in time to complete the work order on or before the specified date. Every division head is required to examine any graphic records in the assistant superintendent's office affecting him, at approximately the middle of each month.

Annual Check of Instructions

Annually in May each divisional head is required to make a personal inspection and check of all printed instructions issued to the men in his department by the superintendent of distribution. This involves making certain that every man in the division has in his possession all instructions which have been issued to him, and that worn or defaced copies are replaced with new ones. The assistant superintendent of distribution supplies lists of instructions so issued.

In order that difficulties experienced with various contractors, wherein they have been found to disregard the company's reasonable requirements, may become a matter of record, divisional heads are required to report to the department secretary any of the following or similar incidents which may come to their notice as soon as possible after occurrence: Meter loops incorrectly wired; meters improperly located; entrances improperly located; diversion of energy; meter loops jumped without notifying the meter department; connection of customer's load to the wrong meter loop.

Employees required to work a substantial time beyond their regular day are allowed 20 minutes for lunch without pay deduction, and employees working overtime above 4 hours are granted a meal period of 20 minutes without pay deduction.

Further details will follow relative to responsibilities of division heads.

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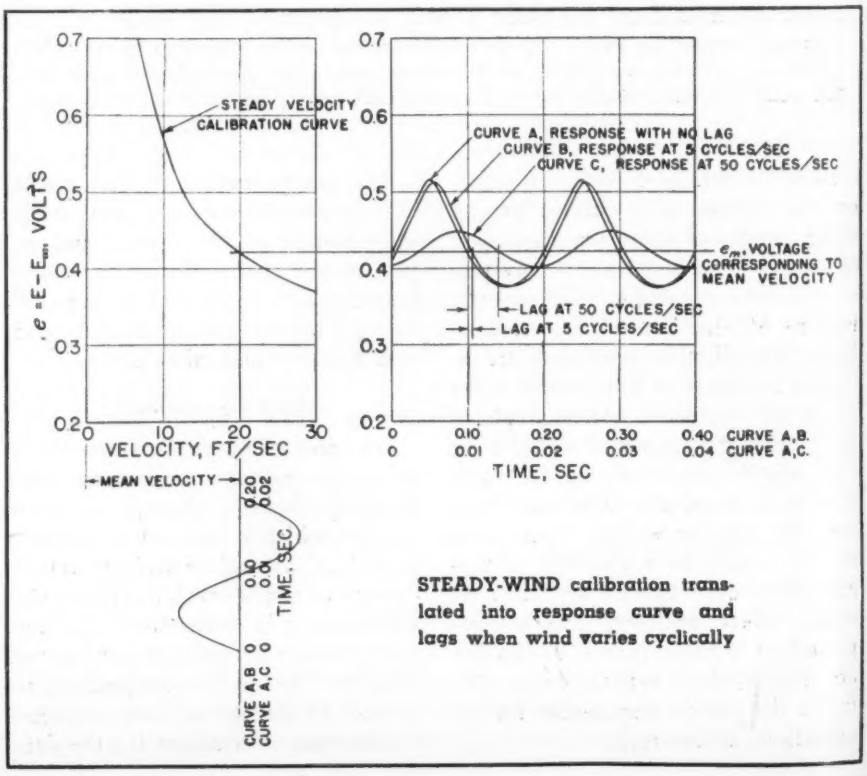
Hot-Wire Anemometer under Variable Wind

Variations of velocity of air flowing past the heated wire (usually platinum) of a hot-wire anemometer produce corresponding variations in heat lost from the wire and in deflection of the associated indicating instrument. For the field of the wind-turbine, preheated air-supply for boilers and for general weather forecasting as well as for aviation tunnels, new techniques are presented in a recent A.S.M.E. paper by Martinelli and Randall entitled, "The Behavior of a Hot-wire Anemometer Subjected to a Periodic Velocity." The analysis assumes freedom from end effects, constant current and proportionality of heat loss to temperature difference.

In the illustration the voltage drop across the wire is related to respective values of steady wind for a particular anemometer. If the wind is periodically gusty and steady-state calibration is converted to the cyclic response curves by the method of isoclines (see *Mathematical Methods in Engineering*, Th. V. Karman and M. A. Biott McGraw-Hill Book Co., New York, 1940).

The curves at the upper right are thus derived for a 0.000532 in. platinum wire 0.285 in. long (4.6 ohms at power temperature) carrying 0.14 amperes and exposed to a wind varying sinusoidally from 12 to 28 ft. per sec. and with a frequency of 5 and 50 cycles per second. It is evident that the lag in response is small at the 5 cps frequency, but appreciable at 50 cps. At the higher rate of wind pulsation the higher harmonics in the response curve are damped out and the response itself approximate the sinusoid.

The essence of the paper lies in the graphical translation from steady-state to periodic wind.



STEADY-WIND calibration translated into response curve and lags when wind varies cyclically

Disinfection with Germicidal Lamps: Air—II*

Fundamental data for design of controlled air flow installations in air ducts or in uncontrolled circulation in occupied rooms—Notes on sterile storage and industrial processes

MATTHEW LUCKIESH,† General Electric Co., Cleveland, Ohio

AIR AND WATER are two obvious essentials to human beings which, when contaminated, cause disease and damage or spoil various products. A unique characteristic of ultraviolet energy used as a germicide is that it does not alter air or water in any noticeable manner. It may produce ozone, but the composition of the glass tube of the germicidal lamp controls the short-wave ultraviolet energy which is most effective in converting oxygen into ozone. Air in a room is contaminated in proportion to the number of occupants. Some of the resulting air-borne bacteria are pathogenic and investigations have been under way for several years to ascertain to what degree air-borne infections can be reduced by irradiating the air with germicidal energy. There is increasing evidence that such infections are reduced.

Two Objectives

Even if rooms could be adequately ventilated by diluting the contaminated air with enough fresh air from outdoors, there would still remain many opportunities for killing molds, fungi, etc., which are present in outside air and which damage and spoil many products. Therefore, the uses of germicidal lamps in disinfecting or sterilizing air may be divided into two general objectives: (1) decreasing the probability of infection of human beings in occupied interiors and (2) decreasing, or entirely eliminating, the contamination of various materials during use, storage, processing, packing, etc. Investigations indicate that germicidal lamps are effective to a degree in interiors such as nurseries, classrooms and barracks. A good deal of fundamental research has proved that disinfecting and sterilizing of air is practicable in many places involving materials and products.

Water presents the same kind of problems and objectives. At the present time the dangers to human beings inherent in contaminated water are more widely recognized than those inherent in contaminated air. Water containing pathogenic organisms is dangerous to the individual who drinks it. Germicidal energy cannot compete with chlorine in disinfecting water in large cities where 100 or 200 gallons per inhabitant are treated daily and only a quart is drunk per inhabitant. However, germicidal lamps appear to be feasible at least for towns and villages, for many industrial uses, and are extremely so for individual use in homes wherever the water may be contaminated. In all these cases pathogenic germs are readily killed although they are more resistant in humid air than in dry air. In water a lethal exposure is several times that in air. Other organisms such as molds and fungi are much more resistant.

Energy Absorption

In the use of germicidal lamps, air differs greatly from water in that it does not appreciably absorb germicidal energy, but water does. Furthermore, the absorption coefficients of waters, which appear the same, differ markedly for different waters. Therefore, depth of air is not a restricting factor as depth of water is. In fact, refined measurements indicate no appreciable absorption of germicidal energy of $\lambda 2537$ for a depth of 100 ft. of air. Of course, the intensity of the energy varies inversely as the distance from the source and must not be so low that the exposure (intensity $\times$ time) is below that necessary to kill the desired percentage of the bacteria. On the other hand, the depth of clear water which absorbs 90 percent of the incident energy varies, among drinkable waters, from a few inches to a few feet.

Disinfecting Controlled Air

The fundamental data, upon which is based the design of installations of germicidal lamps in air-ducts, were obtained in an extensive series of researches involving all the basic factors of air-flow and variations of humidity. The basic data have been published elsewhere.[1] By extensive researches involving accurate measurements of the germicidal energy, various basic facts have established the exposures necessary for any degree of killing or survival-ratio of the bacteria. For practical purposes the fraction P/P_o of the original number of germs surviving, after having been exposed for a time t to an intensity E of germicidal energy, is expressed by the exponential function of the form $P/P_o = e^{-KET}$ when e is the base of the natural system of logarithms

* The previous installment, September 29, 1945, page 72, gave an appraisal of disinfection by means of ultra-violet energy. The third and final part will deal with water treatment.

† Director Lighting Research Laboratory.

[1] Tests and Data on Disinfection of Air with Germicidal Lamps, Matthew Luckiesh and L. L. Holladay, *General Electric Review*, 45, 1942, 223.

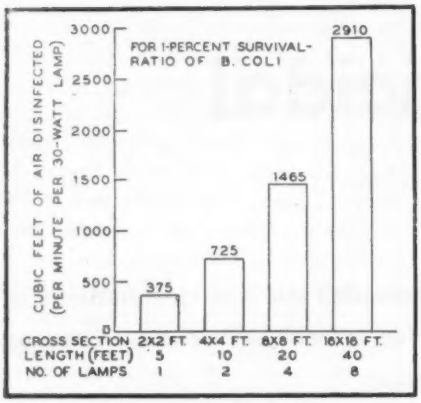


FIG. 1—Rate of disinfection of air, in cubic feet per minute, per 30-watt germicidal lamp, for ducts of various sizes. These data apply to a killing of 99 percent of the B. coli

and K is a constant depending upon humidity. P/P_o is the survival ratio.

From fundamental data such results as illustrated in Fig. 1 are obtained. It is seen that as the cross-section and length of the air-duct are increased, within the range indicated, the volume of air that can be disinfected by one 30-watt germicidal lamp to a survival-ratio of pathogenic germs of 1 percent (99 percent killed) varies from 375 cu. ft. per minute for the smallest of the four ducts to 2,910 cu. ft. per minute for the largest one. These results are for zero reflection-factor of the inner walls of the duct and include no factor of safety. If a higher percentage of killing is desired, more lamps are required. For survival ratios of 10, 1, 0.1 and 0.01 percent, respectively, the value in cubic feet of air per minute per lamp for a given duct in Fig. 1 should be multiplied, respectively, by 2.15, 1, 0.6 and 0.44. These constants are based upon the foregoing exponential law which has been fairly well established by experimental data. The complex computations necessary to apply the basic data to various ducts and rooms were made by one of the author's colleagues, L. L. Holladay. They apply to a 30-watt, 36-in. germicidal lamp emitting 11 watts of germicidal energy of which about 99 percent is in the region of λ2537.

Reflected Germicidal Energy

The cubic feet of air disinfected per 30-watt lamp per minute to various survival-ratios of B. coli are presented in Table I for five ducts of different sizes. The bare lamps are assumed to be located end to end along the axis of the duct. No germicidal energy is assumed to be reflected by the inner surfaces of the ducts and no factor of safety is included in the values given.

The effect of reflection of germicidal energy by the inner walls of the duct is shown in Fig. 2 for a duct 8 ft. by 8 ft. and 20 ft. long. Unless the reflection-factor of the walls is high and is so maintained, the value of reflected germicidal energy is not great. It is more important to have ducts which are large in cross-section and of proper length. If a 60 percent reflection-factor can be maintained, the cubic feet of air disinfected to a given degree should be about 50 percent greater than if the walls reflected no germicidal energy.

Disinfecting Air in Occupied Rooms

During winter months forced-air ventilating systems generally use less make-up air taken from the outside than during warmer seasons. Therefore, contaminated air is commonly circulated through the controlled system. Whether the treatment of this air in the air-ducts is sufficient to reduce adequately the number of pathogenic germs and viruses depends upon the number of occupants of a given room and the rate of flow of air from the ventilating system. The latter is measured in air-changes per hour. If there is no ventilating system, the actual circulation of air in a room is caused by various means, including convection currents rising from radiators in the winter-time. The upper portion of the room, above the eye-level, affords a convenient space for killing germs by means of germicidal lamps. We have extensively studied the uncontrolled circulation of air in rooms in winter and have also conducted a series of basic researches involving the killing of B. coli in such rooms. From all these data L. L. Holladay has made extensive computations for interiors of various sizes and containing various numbers of occupants. Inasmuch as the resistivity of pathogenic germs increases with the humidity all the data presented are for a relative humidity of 35 percent. The results for occupied rooms have been published in detail elsewhere.[2] There are several important variables among which are the size of the room and the number of occupants. As the area of the room and height of the ceiling increase, the effectiveness of each germicidal lamp increases for the reason that each lamp is treating more air.

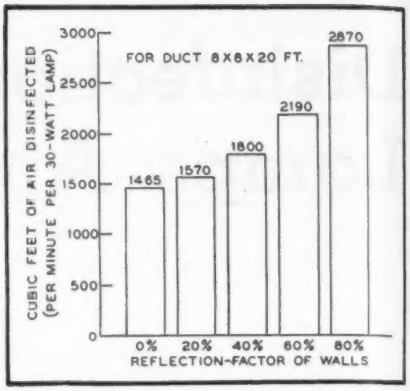


FIG. 2—Effect of reflection of germicidal energy by inner surfaces of air-duct

Some of the results of our computations based upon fundamental experimental data are presented in Table II—Factors Affecting Design. The germicidal lamps are assumed to be located 7 ft. above the floor and contained in efficient reflectors which direct the germicidal energy across the room above the 7-ft. level. Careful study of these few examples reveals various interesting facts and relationships. For example, when the size of the room increases, the efficacy of each germicidal lamp increases correspondingly. This increase in size tends to counteract the increase in

[2] Designing Installations for Germicidal Lamps in Occupied Rooms, Matthew Luckiesh and L. L. Holladay, *General Electric Review*, 45, 1942, 343.

Table I—Cubic feet of air disinfected per minute by each 30-watt germicidal lamp for four different survival-ratios.

Dimensions of duct in feet		Number of Lamps	Survival-Ratio in Percent			
Cross-Section	Length		10	1	0.1	0.01
2 x 2	5	1	805	375	225	165
3 x 3	9	2	1220	550	345	248
4 x 4	10	2	1570	725	470	330
8 x 8	20	4	3020	1465	915	660
16 x 16	40	8	6200	2910	1835	1300

contamination of air by increases in the number of occupants.

Each germicidal lamp, by killing germs, produces the equivalent of a given number of cubic feet of air replacement. In this sense each germicidal lamp is the equivalent of a certain degree of ventilation. In the last column in Table II these equivalents of air replacement per lamp are given for the various cases. The effect of ceiling height is shown for the room 24 ft. by 24 ft. With the same number of occupants, the equivalent air replacement per lamp is 230 cu. ft. and 460 cu. ft., respectively, for ceiling heights of 12 ft. and 17 ft. The reason for this increase lies in the larger volume of air being treated with the same number of lamps in the case of the higher ceiling. These results depend upon the rate of circulation of air in the irradiated space or the time during which the air is exposed to the various intensities of germicidal energy. There are many factors involved which are not included in Table II. A rule-of-thumb method used at the present time provides about one 30-watt germicidal lamp for 300 sq. ft. of floor area.

How extensively germicidal lamps will be used in occupied rooms depends upon the increase of evidence that they will reduce the incidence of air-borne infections. However, a great reduction in the concentration of air-borne bacteria is actually a sufficient basis for installing them. It appears desirable at the present time to use them in classrooms in schools, in barracks, in offices, in theaters and in various crowded interiors. It is not necessary to achieve 100 percent killing of pathogenic germs. Pasteurization of milk, for instance may leave 10 percent of the germs alive, yet it greatly reduces the probability of disease from milk.

Sterile Storage

There are countless needs for storing materials in sterile air. A germicidal lamp provides such storage in simple cabinets as illustrated in Fig. 3. Other cabinets might have a germicidal lamp inside at the top and near the front. In other cases a screen of germicidal energy may be projected down over the opening of a door. Such simple applications of germicidal lamps in cabinets and rooms for sterile storage are to be found in laboratories, hospitals, surgeries, dispensaries, barber shops and many other places. A small cabinet is useful in the home for keeping the baby's things. How many millions of these cabinets will be in use eventually depends upon educating the potential users and the public in the refinements of protection from these minor organisms which, though invisible, are dangerous and destructive. This field and others must be developed upon faith which in turn is erected upon sound knowledge.

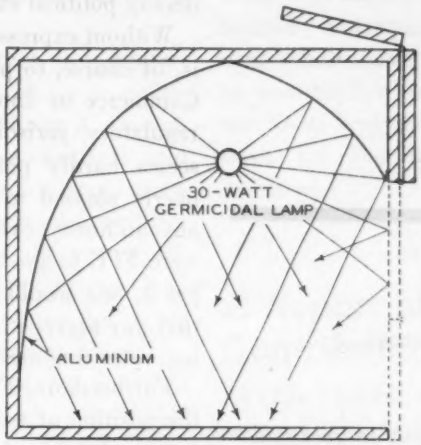


FIG. 3—Cross-section of a sterile storage cabinet. Simpler installations are practical for keeping the air sterilized

Industrial Processes

There are many processes in which germs, molds, fungi, etc. may contaminate a product. The entire air need not be treated. For example, a manufacturer of a skin cream found that eventually the surface of the material immediately under the cap of the closed jar became moldy. The jars and caps had been sterilized in boiling water and the cream was sterilized in the manufacturing process. The mold came from the air during packing. An enclosed tunnel was built over a conveyer belt and a number of germicidal lamps were installed inside. The sterilized caps and jars coming from the boiling water were placed on this belt. At the other end of the tunnel was an enlarged chamber. The operator looked through a plate glass and her gloved hands worked through an opening below the glass. A fan at the beginning of the tunnel forced air gently through the tunnel and out of the enlarged chamber through which the gloved hands worked. Thus no bacteria could get into the opening and the living organisms in the air were killed by the germicidal lamps in the enclosed tunnel.

There are many similar applications. However, it should be borne in mind that germicidal energy will kill bacteria only if it can get at them in sufficient intensity for a sufficient period of time. Furthermore, this energy does not penetrate deeply into most materials. In addition to these facts, it should be kept in mind that this energy may actually damage some products.

Table II—Some factors affecting design of germicidal installations in occupied rooms.

Size of room (in feet)	Number of occupants	Number of 30-watt lamps	Sq. ft. of floor area per lamp	Equivalent cu. ft. of air replacement per occupant
12 x 12 x 12	2	1	144	1400
24 x 24 x 12	25	4	144	230
24 x 24 x 17	25	4	144	460
40 x 40 x 12	50	6	267	288
60 x 60 x 12	100	10	360	428
60 x 120 x 30	1000	14	514	257
100 x 200 x 18	1000	25	800	375
100 x 200 x 25	1000	40	500	585

A.S.A. Preparing 'Specs' for New Type Wood Poles

The American Standards Association has been requested by the government to use its emergency procedure in developing specifications for wood poles made from jack pine, red pine, western white pine, inland types of douglas fir, western hemlock, western larch and certain other miscellaneous species.

Primary purpose of this job will be to conserve our natural timber supply and secondly to channel the production and use of poles so that all purchasers will have a fair share of the available timbers.

Specifications will cover prohibited and permitted defects, such as sap stain, twist grain, insect damage, knots, and scars. Such matters as manufacturing requirements, dimensions, storage, and handling will also be covered.

Dr. R. H. Colley, Bell Telephone Laboratories, Inc., is chairman of the committee that is already at work.

Editorials

S. B. WILLIAMS, *Editor*

FPC in Danger of Losing Independence

IF LEGISLATION enabling the President to reorganize federal agencies passed last week by the House is adopted by the Senate, the Federal Power Commission may lose its independent status. It alone of all the independent federal commissions regulating public utility interstate operations was in no way exempted from the terms of the bill.

That reorganization of the myriad of government agencies to prevent duplication of effort and overlapping of responsibility is a good thing is generally accepted. If the chief executive is to be responsible for administering the government, he should not be hamstrung by inefficiency or by a network of limitations.

On the other hand, one cannot lump government functions as one would apples. Certain operations pertain directly to the business of running a government, while others are judicial or quasi-judicial in nature. To the latter is delegated certain legislative responsibility in that they may proclaim regulations which become the law of the land until set aside by the courts or Congress.

To preserve the integrity of such functioning, these latter agencies, among them the FPC, should always be independent, that is, as independent as any agency of a democratic government properly should be. Every safeguard must be thrown up to prevent such agencies from being touched by political influence. Such commissions should always be bi-partisan and free to make their decisions fairly without fear of political recrimination.

Of course, the President is not required under the pending legislation to reorganize FPC or any other agency. He may of his own free will retain it in its present status, but in so doing he does not free the Commission from the possibility of later control. The very act of permitting continued independence is in the final analysis akin to placing a halter on the Commission. Failure to reorganize leaves the implication that just so long as the President is not displeased with the actions of the Commission it may stay independent. No suggestion is intended that President Truman wants to hold a sword over the Commission's head, but it would be strange indeed if under such circumstances FPC did not temper its actions not only to the mind of the gentleman in the White House but to those on whom he relies for advice. In other words, the very act of leaving FPC independent under such circumstances is bound to have the effect of introducing political expediency into its deliberations.

Without express exemption by Congress, the alternative is, of course, to place FPC in some department, such as Commerce or Interior. Since FPC by law has certain regulatory jurisdiction over public power projects, it seems hardly possible that one department would be overly pleased to have some other department exercise any authority over its operations as would be the case were FPC to go to Commerce. Yet, if Interior were to get it, one would have to be overly credulous to believe that any segregation of cost for the purpose of determining rates was arrived at wholly without partiality.

Furthermore, FPC under Interior would be placed in the position of trying to regulate private electric utilities fairly while the Department was either actively in competition or was selling to private companies. What a quasi-judicial travesty that could and most likely would be! Even if the Commissioners by virtue of Congressional appointment could keep themselves pure of mind there would still be the staff members whose employment would, at least in their own minds, depend upon their recognition of their master's voice.

It is strange indeed that the House debate did not show very much evidence of an appreciation of dangers that might follow any inclusion of FPC in the reorganization bill. We can only hope that the Senate will be more alert in protecting the Commission.

Restrictive Building Codes

MAN AFTER MAN in government circles who has studied the post-war construction needs has come to the conclusion that our several building codes are too restrictive. More freedom of the use of new materials and new methods are urged as one way in which to secure the lower costs necessary to stimulate a large construction program.

Restrictions in building codes come about in many ways, some from good motives and some stemming more from self-interest. Fundamentally building codes are for the purpose of insuring the public that structures will conform to requirements of minimum safety. Codes are not supposed to be, and never should be used for the purpose of protecting labor or manufacturers. Neither should they be used as a vehicle for making effective an industry program of usefulness, convenience or adequacy, no matter how beneficial it may be to the public. Codes, in other words, should not become substitutes for selling.

In the electrical industry we have the National Electrical Code, now undergoing its first revision since the

war began. Sponsor for the Code is the Electrical Committee of the National Fire Protection Association on which are represented the several branches of the electrical industry, inspectors, the public, government, labor, engineering bodies and others. Even with such a representative committee, restrictions beyond the requirements of minimum safety do creep in and will continue until the committee determines what constitutes minimum safety.

It is in local ordinances, however, that the greatest restrictions arise, for there labor particularly is politically strong and can insist on certain things it particularly desires. The most common in the electrical field is metal clad wiring. In addition, there are restrictions imposed by the local inspection departments in the form of special rules. Where such rules bar the use of approved materials and methods, they add to the cost load of the prospective owner who though he may desire the materials used is not permitted to decide for himself.

With more and more people attacking our building codes as being too restrictive, we can be certain that unless the respective branches of the building industry start cleaning their own houses soon, some remedy will be sought by government. And when that comes, industry may find itself without a too greatly improved code and with considerably less voice in its revision.

How Lighting Can Implement Call of President for Safety Campaign

ACCIDENTS sap one of our basic freedoms, in that they destroy the security from needless death, destruction and suffering. Such was the substance of a letter recently written by President Truman asking the National Safety Council to mobilize the country's safety forces in a united campaign to minimize accidents.

Proper lighting can be one of the most potent forces contributing to safety, yet unfortunately, outside of street lighting, we have very little factual data in support of that claim. In manufacturing operations, it has seemed almost impossible to make tests that would separate lighting from all the other factors that contribute to safety experience. Nevertheless, the knowledge is so important that some real study should be made. Even a few data developed in this way are better than the information we now have which is based largely on opinion.

Nor should our studies be confined altogether to industrial processes. Accident records in homes, offices, and other places need studying to develop statistics so that proper corrective practices can be recommended.

On the streets and highways, the lighting industry in cooperation with traffic engineers and municipal authorities has devoted considerable study to the mounting night-driving accidents resulting in an educational campaign that is showing splendid results. While the initiative has come mostly from the manufacturers of street-lighting equipment, cooperation from the utilities is growing and we can look forward to improved street lighting in a great many cities next year.

It is unfortunate that more progress cannot be made in the use of gasoline taxes for highway lighting improvement. The stumbling block appears to be other interests in the gasoline and road materials industry who apparently begrudge every cent of this money not used for highway extension or repairs. However, with the President solidly behind an all-out safety campaign, it should be possible for the lighting industry to get an attentive ear to its records of accident reduction when specifications for the federal highway program are being prepared.

A Report of the Utility Industry's Contribution to Victory

AFTER THREE and a half years of service to the war agencies, the Council of Electric Operating Companies has closed its operations. Its work was done when the war was won.

During the 42 months it was in Washington its primary occupation was in finding ways that the electrical utility industry of the country could be helpful in promoting victory. A documentation of its own achievements might not be impressive, but a report of the contribution of the industry it represented would be evidence of an all-out effort to strengthen the activities of every branch of government with a war responsibility.

Such a report has been prepared by the Council, under the title of "Power for War," as a tribute to the men and women employed by the electric operating companies. It tells a story of accomplishment that should make all of those engaged in the business proud of the part they had to play in the winning of the war.

Sprinkled through the pages of this document are letters from the heads of all the important war services freely expressing appreciation for the job that the utilities did. In the absence of any Army-Navy "E" or other official honors, these statements should make all of the industry's employees feel the worthwhileness of whatever effort they made personally.

While this report of the industry's war contribution will be made available to all companies, its distribution should not be confined to employees, but proudly the industry should place it in the hands of its investors that they may have equal pride, and also in the hands of all others who make or affect public opinion. For, as the president of the Council, Tom P. Walker, so well states in the foreword, "So quiet and efficient was the complete performance that few appreciate its magnitude."

While the Council closed its operations without fanfare, the industry should not let the opportunity pass to tell of the greatest war contribution made by any major industry of the country. This report offers that opportunity in a dignified and humanly appealing manner.

WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

FPC Not Exempted in Reorganization Bill

MUCH to the surpise of almost everyone concerned, the House has passed a bill for re-organization of the executive branch of the federal government wherein exemptions from the re-shuffling powers granted the President have been held to so few agencies that Mr. Truman can, if he chooses, do a real reorganization job.

The bill still must go through the Senate, where executive agencies have long been successful in destroying legislation distasteful to them.

Federal reorganization was sought early by Mr. Truman, who asked for complete authority, insisting that no agency be exempted. Washington smiled wisely and agreed that Mr. Truman might well have less trouble than did his predecessor, who was beaten on such a request in 1937, and in 1939 was given the authority he asked—with 21 exemptions. When a bill identical to that finally enacted in 1939 was introduced in the House, everyone forgot the whole thing.

Broad Authority

Red faces were a dime a dozen in the executive branch recently when the House committee turned in a unanimous report favoring a bill giving the President broader authority than was contained in the 1939 bill, and exempting completely only three agencies, the Interstate Commerce Commission, the Federal Trade Commission and the Securities and Exchange Commission. Several other independent agencies, the Civil Service Commission, Federal Communications Commission, Tariff Commission and the Veterans Administration earned backhanded exemptions.

As a result of all this, the Federal Power Commission awakened to find itself in a fair way to becoming a subsidiary of the Commerce or Interior departments rather than continuing its existence as an independent agency subject to no control other than that of Congress or the President. This possibility became a great deal more real last week when the House, in passing the bill, beat down an amendment which would have exempted FPC and a number of similar agencies just as ICC, FTC and SEC were exempted. The amendment was beaten roundly, 161 to 127, indicating that even if FPC were to gain exemption in the Senate version of the bill, House conferees would have a strong record behind them if they chose to insist on their position with regard to exemptions.

Exemptions

Opponents of the Halleck amendment, which would have exempted FPC and seven other groups, argued —not without reason—that the way to achieve the reorganization which all concede to be highly necessary is to pass an act completely without exemptions. The ICC, having been in business 60 years, they conceded to be beyond reach. Much the same argument applied to the FTC, second oldest of such agencies. No one, however, came up with any reason why SEC, one of the youngest commissions, should be exempted when FPC, FCC, the Maritime Commission and others were not exempted. Rep. Franck R. Havenner, California Democrat and former chairman of California's Railroad Commission, summed it up aptly enough when he declared, in a plea for exemption of FPC, that in reply to his query as to why FPC had not been exempted "I have been unable to obtain any answer except that the committee desires to exempt as few agencies as possible."

It was argued, with considerably less reason, that mere granting of the authority to President Truman did not mean that he would put agencies which should remain independent under Cabinet officers. The reply to this was that in such a case, authority to do so would be unnecessary, would in fact merely constitute a temptation.

People who follow such things closely believe that FPC, if shifted at all, would go either to the Commerce or Interior Departments. If an intra-Cabinet fight between Secretary Ickes and Secretary Wallace were to develop over the matter, Ickes would stand to win. Were FPC to be taken over by Interior a situation would develop wherein the old complaint that FPC, as a quasi-judicial agency, is its own prosecutor, judge and jury would be replaced by the complaint that it is prosecutor, judge and jury in cases where its own relatives were at bar. Under the Bonneville and Fort Peck acts, FPC must approve rate schedules under which energy of these developments is sold. It must make the cost allocations on which these rate schedules ostensibly are based. The same requirements unquestionably will be included in future legislation under which Interior will develop more power sites. To require FPC to report to the same administrative officer to which the agencies it regulates must report might not change its findings at all, but it would certainly create a situation undesirable to many parties and unnecessary to the vigor of any.

Congressional Relations Good

FPC in past years has had sufficiently good Congressional relations to escape serious damage to its appropriations, to escape real trouble on confirmation of its members and to throttle absolutely such legislation as that designed to junk the Jersey Central Power & Light precedent. It has numerous and powerful friends in the Senate. Thus, it has not yet lost its independence.

One of the surprising aspects of the whole performance on the reorganization bill is the absence of any mention of TVA. Referred to only once in the two days' debate, TVA was not exempted. Customarily, TVA men in Congress never let a bill which could affect the agency get cool in its committee pigeonhole without writing amendments to exempt it from whatever is proposed. Regarding this bill, TVA says only that it sought no exemption. This can only mean that the word has been passed that TVA will ride out the forthcoming reorganizational storms untroubled.

NEWS OF THE WEEK

Truman at Kentucky Dam Dedication Praises TVA

President Fails to State Clearly Administration's River Control and Development Policies—Declares That There Is Much Work to Be Done on Major Watercourses and Infers Valley Authorities Should Be Set Up

Tennessee Valley Authority "is no longer an experiment, but a demonstration," President Truman declared Wednesday at the dedication of Kentucky Dam, last of TVA's main river plants, near Gilbertsville, Ky.

The President's speech, which many had expected to be a major offering which would spell out the administration's river control and development policies, proved instead to be another of the inexplicit pronouncements such as Mr. Truman has made in the past. As in his recent message to Congress, the President told his audience that there remains a great deal of work to be done on major watercourses and inferred that the Valley Authority device is the proper way to do it. But any who hoped for a ringing presidential endorsement of the Authority as against the old-line-agency concept of river basin development could only have been disappointed in the message.

"The completion of this dam marks a new high point in modern pioneering in America," Mr. Truman declared . . . "By all except a small minority it is now regarded as a great American accomplishment, of which all of us are proud . . . it has inspired regional resource development all over the world. . . . I have never had occasion to regret my support of the TVA and of the idea it represents. Its record has fully justified the hopes and the confidence of its old friends . . . here in this valley there has been firmly established the basic principle of development of resources on an autonomous regional basis."

TVA's success, the President asserted, "is just plain common sense. It is common sense hitched up to modern science and good management . . . instead of going at the river piecemeal with a dam here and a dam there, the river was treated as a whole. The dams were all designed so that they would fit together as a unit and in that way get the most service out of the river for mankind."

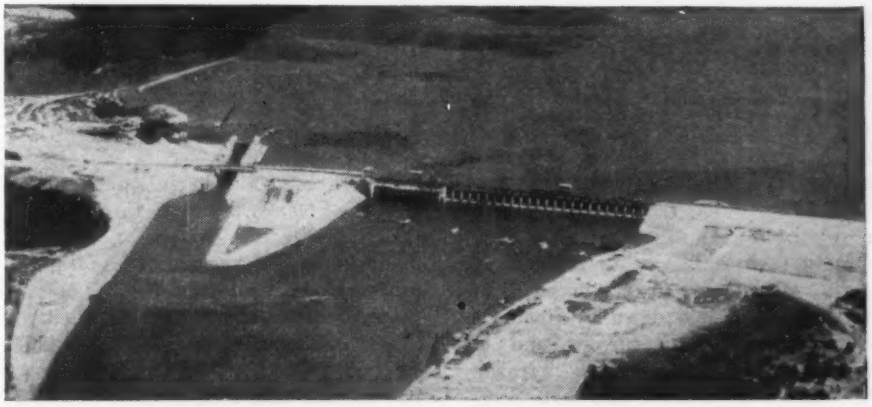
Agreeing with the late President Roosevelt that the river's usefulness "transcends mere power development," Mr. Truman cited flood control, soil erosion prevention, re-forestation, elimination of marginal lands from cultivation, transportation and distribution and diversification of industry as other TVA policies which have been proved, and added:

"It is easy to see that most of these common sense principles can be applied to other valleys, and I have already recommended to the Congress that a start be made in that direction. Careful planning and common sense development can convert the idle and wasting resources of other valleys into jobs and better living.

"No two valleys are exactly alike, of course. For that reason, the details of just how this region or that region should be developed are matters that require study and judgment in each particular case. The procedure in each valley may have to be a little different. But the underlying common sense principles of this development here in the Tennessee Valley can provide guidance and counsel to the people in other regions who likewise aspire to put their resources to the greatest use.

"Let me emphasize that in the last analysis, such a development is a matter for the people themselves to decide. Here in this valley, state and local agencies, public and private, have joined with TVA in a two-way partnership. This was a natural result of the policy of regional decentralization. The same policy ought to be followed in the other river valleys as regional agencies are created by the Congress and set to work.

"We must continue all over the United States to wage war against flood and drought. Our vast store of natural resources can be made to serve us in peace with the same efficiency as they did in war. We should exercise our common sense, go ahead, and continue to get the job done."



DEDICATED—After being in service for a year, Kentucky Dam of the Tennessee Valley Authority at Gilbertsville was dedicated, Wednesday, by President Truman

Work of WPB Ends; Krug Resigns, Nov. 3

Agency Will Be Replaced by Civilian Production Administration under John D. Small

The War Production Board, which has exercised the broadest control of American business, industry, and life since early in 1942, will be replaced November 3 by the Civilian Production Administration, which will be headed by John D. Small, for the past year executive officer of WPB and before that a Navy captain charged with expediting various Navy programs.

The resignation of J. A. Krug as chairman of WPB, effective November 3, was accepted by President Truman. Krug's plans for the future were undisclosed early this week but informed speculation was that he would join Floyd Odlum, president of the Atlas Corp., an investment and industrial holding company.

Krug Served Many Agencies

Krug's resignation will close a war career which began in June, 1941, when he left the Tennessee Valley Authority, where he was manager of power, to head the two-man power branch of the Office of Production Management. He rose steadily in WPB until, in February, 1943, he was program vice-chairman and director of the Office of War Utilities. About 15 months later, he left WPB to join the Navy; and after several months in Europe, during which he reported on the utility reconstruction necessary there, he became acting chairman of WPB when Donald Nelson went to China on a presidential mission. Soon thereafter, he became full chairman of WPB.

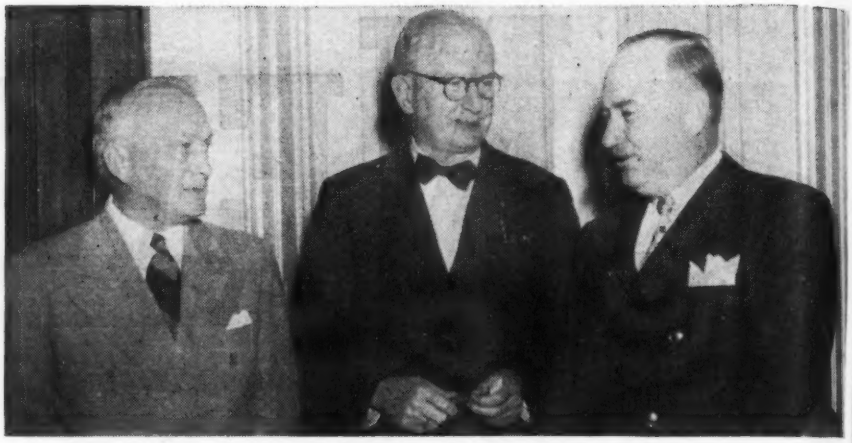
Small was described by WPB sources as a man who favors lifting controls as rapidly as possible, but one who is unlikely to do so as promptly as Krug. Persons who favor retention of controls will find a more attentive listener in Small than in Krug, one high WPB official declared.

Small opposed the open-ending of utility construction which director Edward Falck of the now-defunct OWU pushed through last summer as the war ended suddenly.

It was believed that Small would be a relatively minor figure in the determination of CPA policy and would serve rather as the executor of reconversion policy laid down by Reconversion Director John Snyder and his predecessors in that job, Treasury Secretary Fred Vinson, and State Secretary James F. Byrnes.

CPA will carry on WPB's run-out functions of maintaining inventory control, breaking bottlenecks where necessary, expanding production and limiting use of scarce materials.

No decision on the matter had been reached early this week, but it was believed likely that CPA would include a small staff to provide expert advice on utility problems. Paul Valle, deputy administrator of OWU's Power Division, is performing this function for WPB.



NAMED TO FEDERAL POWER COMMISSION—Richard Sachse, left, California, and Harrington Wimberly, right, Oklahoma, pose with Senator Burton K. Wheeler, chairman of the Senate Interstate Commerce Committee which voted to recommend the confirmation of both men as Federal Power Commissioners

Wimberly Sworn In; Sachse Takes Office Next Month

Harrington Wimberly was sworn in as a member of the Federal Power Commission last week to fill the unexpired term of former chairman Basil Manly. The appointment expires in June, 1948.

Richard Sachse, former chairman of the California Railroad Commission, who was appointed to FPC to fill the unexpired term of John Scott and whose appointment was confirmed unanimously by the Senate with Wimberly's, will not take office until about November 1, an FPC spokesman said. Sachse, after appearing before the Senate Interstate Commerce Committee, returned to California to complete certain duties as a member of the California Railroad Commission.

Governor's Plan to Wire Virginia Schools Retarded

The program of Gov. Colgate W. Darden to bring electricity to 2,100 schools in Virginia now using kerosene lamps (ELECTRICAL WORLD, August 11, page 8) is making slow progress because of the lack of cooperation on the part of some 20 of the 43 electric companies in the state and of some of the school boards.

Larger companies in the state such as Virginia Electric & Power Co. and Appalachian Electric Power Co. and the older established cooperatives were quick to respond to the governor's appeal. About 20 other utilities failed to answer two letters sent by the governor.

School boards, especially in the western counties, have been hesitant to spend the $35 to $50 for wiring the one and two-room school houses.

Potomac Edison Takes Over Page Co. Properties

Potomac Edison Co. has acquired from the Republic Service Corp. three Virginia power companies and a water company for approximately $2,000,000 All of the companies have been operating under one management with headquarters at Luray, Va.

The companies are the Page Power Co. serving Luray and Stanley and adjacent territory, Madison Power Co. serving Madison, Greene, and a part of Orange Counties, Massanutten Power Corp. serving Shenandoah and the immediate vicinity, and the Massanutten Water Corp. serving the same community.

All of the electric companies are small but completely equipped and have interconnections with Virginia Electric & Power Co. and Potomac Edison. These are important as the Page system generates only hydro power.

The four hydro plants, which will give Potomac Edison a total of 11. are the Luray plant, 3 generating units with a total capacity of 1,600 kw.; Newport plant, 3 units and 1,400 kw.; and Shenandoah plant, 4 units and 862 kw. All of these plants are on the Shenandoah River. The fourth plant on the Robertson River has two units and 120-kw. capacity.

Puget Sound Power Sale Brings Storm of Criticism

Proposed Purchase of Private Owned Utility by Washington P.U.D.'s Arouses Seattle Municipal Interests—Guy Myers, Fiscal Agent for Purchasers, Defends Transaction—$135,000,000 Bond Issue Planned

In Seattle last week a tempest of criticism raged about the projected sale of Puget Sound Power & Light Co., one of the largest private utilities in the Pacific Northwest, to some 15 public utility districts in western Washington.

In the middle of it sat Guy Myers acting as fiscal agent for the P.U.D.'s who went through a similar storm in Nebraska, from 1940 to 1944, when he negotiated purchases of more than $100,000,000 worth of electrical properties throughout the entire state.

Now, Mr. Myers shrugged his indifference toward what P.U.D. officials branded as desperate attempts by a powerful eastern and western private utility combine to break up the transaction.

Calls Transaction Sound

Said he, "It is an economically sound transaction. It will benefit the people of the state. It is a bona fide proposition. It is as out in the open as a fish in a goldfish bowl. It will benefit the stockholders of Puget Sound Power & Light. I am satisfied that the deal will be consummated successfully."

His confidence seemed fairly well founded. Flanking him in week-long conferences to form a syndicate to underwrite one of the biggest (they say the biggest) revenue bond issues ever contemplated in the nation—$135,000,000—were a battery of finance men and attorneys from Wall Street and Chicago.

These included John B. Dawson, partner of the New York law firm of Wood, Hoffman, King & Dawson; Jackson E. Cagle and C. W. Laing, Jr., of John Nuveen & Co., Chicago; and Scott Bromwell, R. E. Simond and Clifford Campbell, all of Halsey, Stuart & Co., New York and Chicago financial firm.

Indicating that the vast resources of the Mellon interests might, also, be brought into play in the liquidation of P.S.P. & L. was the fact that Charles W. Kennard, vice-president of Mellon Securities, Inc., New York, was scheduled to arrive in Seattle October 8.

Criticism—and what had all the earmarks of powerful opposition to the sale—came from two sources.

In Washington, Rep. Lyle Boren, Oklahoma Democrat, moved to revive the activities of his subcommittee investigating operation of the Holding Company Act. The subcommittee was organized last spring after Boren had denounced the sale of Nebraska Power Co. to a semi-public body in Omaha. It was indicated that the subcommittee would investigate the details of the Puget Sound proposition.

In Seattle, members of the City Council were vexed over being ignored by the P.U.D.'s, Mr. Myers, and the bankers in the negotiations. They did not like the idea of being expected to purchase distribution facilities within the metropolitan area for use by their own city light, without being told about the price they would be expected to pay.

They were apprehensive of prospects of having the facilities "rammed down our throats at an arbitrary price, or face cut throat competition from the P.U.D.'s." They feared this because the P.U.D.'s asserted under state law they needed no franchise to operate in Seattle. Puget Sound's franchise expires in 1952.

Mr. Myers, his associates, and the P.U.D.'s in refutation announced that the 15 P.U.D.'s would give a pledge in writing to Seattle not to enter into "cut throat" competition. They explained that Seattle does not have to buy the facilities but may have them for nothing—if it is willing to wait for them.

"As the bonded indebtedness is retired through earnings, the entire distribution system will become cheaper," Mr. Laing explained. "In from 25 to 40 years, depending on the earnings, it will automatically revert to the city. Seattle may step in at any time and buy them. The longer it waits, the cheaper they will become."

The generation and transmission facilities, he said, would be retained by the district issuing the bonds and operated by it, "for the equal benefit of Seattle, Tacoma, the P.U.D.'s and any other public power interests, in a pool which is designed to deliver the greatest amount of power at the lowest possible cost to each agency."

At the same time the vigor of efforts of private power to block the transaction could not be underestimated. If the stockholders voted to sign on the dotted line—and it was believed the question would be submitted to them soon—they would be writing the swan song for more than half of all the private power product production, transmission and distribution facilities in the state of Washington. For the remaining five private power companies this could not be considered an advantageous position.

20 YEARS OLD—Frank H. Jones, center, president of the Lighting Engineers Club of New England, and "Cliff" Emerson of Sylvania Electric Products, Inc., cut a birthday cake given to the Club in honor of its twentieth anniversary. Frank Spano, Malden Electric Co., and Power Engineers Association of New England, looks on with approval at the recent joint meeting of the two organizations in Salem

Court Cases Follow Texas Power Strike

The strike of employees of the Lower Colorado River Authority which deprived some portions of the system of all electric service for 59 hours is over leaving in its wake a series of court cases.

Created by the Texas Legislature, the Authority maintains it cannot legally bargain with any labor union. Employees, members of Local 520, International Brotherhood of Electrical Workers, deny this, went out on strike, and are now "locked out."

As soon as the strike began on October 1, (ELECTRICAL WORLD, October 6, Page 6) the Authority acted to restore service through interconnections with business-managed and municipal utilities. This resulted in some cases of vandalism.

At Austin, Tex., ten employees are out on $100 bonds after answering charges that they injured Authority property.

In Llano, Tex., one of the last towns to have service restored, District Judge Raymond Gray granted the Authority's petition for a temporary injunction against its former employees returning to any of its property. The injunction does not prohibit picketing. The order names 91 persons. A hearing for a permanent injunction was set for October 13. The Authority is also asking $100.000 damages against I.B.E.W. and its former employees.

Max Starcke, general manager of the Authority, has announced that employees participating in the power stoppage would not be rehired, and war veterans are receiving preference in replacing them.

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San Diego Employees Get Retroactive Pay Raise

About 1,100 employees of the San Diego Gas & Electric Co. received retroactive pay increases totalling $122,000 on September 12. The increase was in the form of a 4 percent blanket bonus that covered the period from August, 1944, to August, 1945, and was awarded to both union and white collar workers alike.

Approval of the increase has been sought from the War Labor Board by the company during the past year. Checks averaged between $90 to $150. The increase does not continue into the 1945-46 year, company officials stated.

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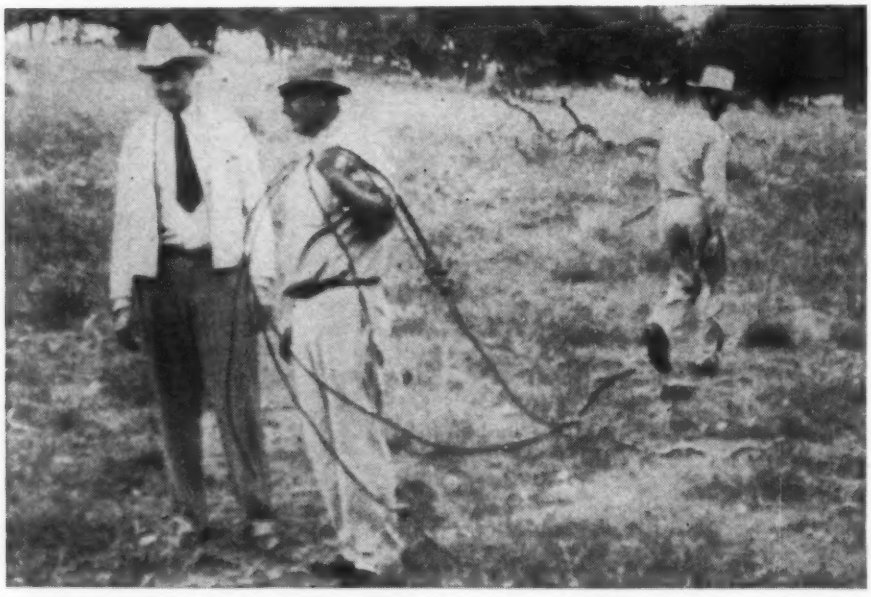
Canadian Output Statistics

The Dominion Bureau of Statistics has released the following output statistics of Canadian central electric stations in thousands of kilowatt-hours:

Period	1945	1944
Eight months	27,186,581	26,953,157
Primary	22,562,690	24,627,630
Secondary	4,623,891	2,325,527
Exports to U. S.	1,754,289	1,749,010
August	3,237,613	3,274,631
Primary	2,723,802	2,949,376
Secondary	513,811	325,255
Exports to U. S.	229,746	236,134
July	3,281,138*	3,149,361
Primary	2,714,357*	2,909,049
Secondary	566,781	240,312
Exports to U. S.	263,776	233,900

*Revised



VANDALISM IN TEXAS—Sheriff Robert Loth, of Gillespie County, Texas, in the left foreground, and F. L. Wilke, superintendent of Fredericksburg municipal distribution system, examine a 66-kw. transmission line cut early October 1 after West Texas Utilities Co. began furnishing power to the Lower Colorado River Authority whose employees cut off electric service when they went on strike

Tacoma Gets Power from Second Nisqually

First power from the $23,651,000 second Nisqually project Tacoma (Wash.) City Light development under construction for 3½ years, was on the line last week, and it was expected that the new 40,000-kw. generator at the La Grande unit would be turned over to the operating department late this week.

Two of the four old 6,000-kw. units at La Grande, taken out of service in the final stages of construction, were again cut in late in September. The new 40,000-kw. generator, built in an extension to the original La Grande power house, was synchronized a few days later and load tests preparatory to operation followed. In early October tests the generator carried loads, in excess of its rating, up to 45,000 kw.

It was expected the remaining two 6,000-kw. generators at La Grande would be restored to service shortly after the new unit goes on the line, giving the plant a capacity of 64,000 kw.

Meanwhile, Alder powerplant, also part of the second Nisqually project, was rapidly nearing completion. One of two 25,000-kw. generators is scheduled for operation November 1 and the second by Mid-1946, according to C. A. Erdahl, commissioner of the Tacoma department of public utilities.

Output of the second Nisqually development will approximate 400,000,000 kw-hr. yearly and will replace much of the $1,000,000 worth of power the city has purchased annually to meet requirements.

Started as an $11,000,000 project, it was boosted to the present cost by wartime conditions, unavoidable delays, and engineering estimates and unforeseen construction difficulties which have postponed completion many months.

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Utility Operating Revenues Rise 0.9 Percent in August

Electric operating revenues of the larger privately owned electric utilities in the United States in August 1945 were $259,618,000, as compared to $257,310,000 in August 1944, an increase of 0.9 percent, according to the Federal Power Commission.

Revenue deductions (including operating expenses, depreciation and taxes) were $201,711,000 or 0.2 percent over those of August 1944.

Gross income, including other utility operating income, increased 3.7 percent to $64,944,000 and net income in August 1945 was $39,402,000, an increase of 10.4 percent from the net for August 1944.

Value of Public Relations to Utility Firms Stressed

Southeastern Electric Exchange Also Told Fuse Characteristics Still Not Ideal and No Revolution in Steam Turbine Practice Impends—Mobile Substations Growing in Favor—Development of Tools Resumed

Finding the answer to the all-important query, "What do the people think of the utilities?" is essentially a matter for the entire ranks who must proclaim the competency and integrity of the industry at every opportunity. That was the admonition of President L. V. Sutton of Carolina Power & Light Co. in welcoming well over 100 engineers to the meetings of the Engineering and Operation Section of the Southeastern Electric Exchange in Raleigh on October 4 and 5. Put differently by Vice-President G. C. Rawls, Louisiana Power & Light Co., it is a matter of "finding out, as never before, what the customer does not like and stopping it; also, what he wants, and doing it."

E. L. Godshalk, president of South Carolina Power Co. and of the Exchange, said one immediate problem is to disabuse the public of the idea that utility employees are all back on their jobs and that materials are already amply available for service expansion and extension. In dealing with the rising labor issues he advocated a distinct personnel department staffed with exceptionally qualified men. Meanwhile, supervisory staffs should formulate a comprehensive and sympathetic program for dealing with returning service men.

Substations, Fuses

In 10 years of development more than 50 mobile unit substations have gone into service and over half the states have at least one, said S. B. Farnham, General Electric Co., in a comprehensive paper. He sees a trend toward having several on each system, one reserved for pure emergencies, the others for routine changeovers and maintenance.

Coordination requires a fuse whose characteristics parallel the operating curve of a very inverse relay and the safe loading curve of the substation transformer, said P. J. Carlin, Florida Power & Light Co., in reading a paper prepared by L. L. Stahler. Such a fuse would have to have nearly twice as high a ratio as the present maximum of 22 for clearing currents at 100 and 0.1 seconds. Savings realizable to power companies would be "almost beyond belief" through greater utilization of transformer capacity, fewer burnouts and fuse-blowings and bettered service continuity. L. L. Crump, vice-president, James R. Kearney Corp., replied that all fuse manufacturers recognize the challenge but will need more consistent information and uniformity of desire than has so far been shown by utilities.

New Hardware and Tools

Opportunity to escape from war-time substitutions and restrictions was welcomed by Mr. Crump in outlining the resumed production of devices deferred during the war. He detailed the improvements available or forthcoming in connectors, anchors, splices, rural cutouts and reclosers, bypass switches and live-line tools. New items announced were jumper clamps, a rope preservative, a line of fittings for aerial cable and a simple device for locating rural faults.

Jerry Clapp of Thomas & Betts announced a new 20-ton compression tool, weighing 18 lb., for making line splices.

Two-way radio is one of the best time-saving tools said H. B. Robinson, Carolina Power & Light Co., after Mr. Carlin had called it a life-saver during the recent hurricane in Florida. Both comments were in discussion of Blair Jenkins' report of tests which showed reasonably consistent FM reception for 48-50 miles under favorable conditions.

Following a discussion of manpower specifications by J. P. Fleming, Ebasco Services, J. R. Carlson, Westinghouse Electric Corp., traced the factors underlying recent steam turbine trends. War research has provided few, if any, new metals for this field, he said, doubting whether the temperatures above 1,000 deg. F. will prove economical. Reheat is the next step in heat-rate betterment. The gas turbine was seen primarily as a peaking unit of uncertain unit cost. In discussion, Chief Engineer W. P. Hammond, Georgia Power Co., wished the utility executives would be assured that the gas turbine and atomic engineering "threats" are going to be a long time in maturing.

Friday afternoon was devoted to two parallel discussions of grass-roots problems in production and distribution. After the Thursday luncheon address by President Godshalk, there was the premiere of the new Westinghouse technicolor film "Dawn of Better Living."

Lumber Strikes End Local Power Service

Recent strikes of lumbermen in the Far West have led to power difficulties in two towns where service is provided by lumber companies.

In Klickitat, Wash., Public Utilities Director Andrew J. Zimmerman ruled that serving not only its own employees but other residents made the power plant of a strike-bound local lumber company a public utility. After conferences with company officials, local merchants, and union officials, he succeeded in getting the power plant workers back on the job. For a time, service had been provided only between 4:30 and 10 p.m.

In McNary, Ariz., W. J. Eden of the Arizona Corporation Commission ordered the Southwest Lumber Mills, Inc., which he called a public utility, to resume service.

The company denied that it is a public utility as it provides service only to its employees and without any charge to them. In addition, H. C. McQuatters, company attorney, said:

"If the commission can suggest some way in which we can comply with their order in the absence of fuel to fire the boilers or man power to operate the powerhouse, we will be very glad to do so."

Speaking for the strikers, Paul Rogers, a leader of the American Federation of Labor union on strike, said the men are not complaining as they knew that they would be without power when they went on strike. Everything in the town is owned by the company and is therefore affected by the strike.

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Co-op to Extend Lines; Utility Asked to Do Same

Maryland Public Service Commission has authorized the Choptank Electric Cooperative, Inc., to build over 250 miles of lines in Talbot, Dorchester, and Kent Counties, denied its petition to extend service into five other Eastern Shore areas, and informed Eastern Shore Public Service Co. that it expects the utility to extend service to Madison and Taylors Island.

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Nashville Gets TVA Line

The first power line to Nashville, Tenn., from the Kentucky Dam, at Gilbertsville, Ky., went into operation recently, Tennessee Valley Authority officials announced. The new 154-kv. line is an adjunct to other TVA service coming to Nashville.

P.G.&E. Must Call for Bids on $49,000,000 Bond Issue

In a decision that may become precedential, the California Railroad Commission last week ordered the Pacific Gas & Electric Co. to call for competitive bids on a proposed $49,000,000 refunding issue, climaxing a 7-month controversy between the company and Halsey, Stuart & Co., Inc. of Chicago. The utility preferred to negotiate a bid with Blyth & Co., but the decision opens the market to all, the situation desired by Halsey, Stuart.

Sitting en banc, the California Commission, which for several months has been considering evidence on whether or not to change its long-established policy and make competitive bidding compulsory, voted three to one for the order.

Ira H. Rowell, the dissenting commissioner, took his stand on the basis that "in fairness to the particular utility applicant the Commission should either candidly state why competitive bidding is deemed to be a prerequisite to issuance of its securities or it should announce now that the intention is to apply a similar rule to all."

In local circles it was believed that the Commission's swift action in the P. G. & E. case, issuing the competitive bidding order though it has not concluded its own policy-making investigation, was influenced by an earlier statement from President James B. Black that the company was prompted to move as rapidly as possible with its refinancing program because of uncertainties over the forward tax situation.

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Willkie Memorial Building Dedicated in New York

Wendell L. Willkie, former Presidential nominee and prominently identified with the public utility industry for a number of years as president of the Commonwealth & Southern Corp., was honored on the first anniversary of his death on October 8, when the Willkie Memorial Building of Freedom House at 20 W. 40th St., New York, was formally dedicated to his memory. The building will house agencies which are fighting for his ideals.

The outdoor dedication ceremony, held on the second-floor balcony of the remodeled building, was heard by several thousand New Yorkers and by a nation-wide radio audience. Sumner Welles, former Under-Secretary of State, led the program of tributes, while Dr. Harry D. Gideonse, president of Freedom House, sponsor of the ceremony, read messages from President Truman, Governor Dewey, Mayor La Guardia and the British, French and Chinese Ambassadors to this country.

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Surplus Property Sales

Surplus property sales up to July 31 as announced by the Reconstruction Finance Corporation included:

Generator-set units—total cost, $9,903,000; total sales, $1,010,000; on hand, $7,383,000, cost price.

Motors—cost, $1,307,000; sales, $442,000; on hand, $571,000.

Transformers—cost, $1,194,000; sales, $430,000; on hand $616,000.

Other electrical machinery and equipment—cost, $5,770,000; sales, $607,000; on hand, $4,562,000.

Rubber-insulated copper wire—cost, $1,612,000; sales, $226,000; on hand, $1,209,000.

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Defers Accounts Hearing

The Federal Power Commission has postponed until December 4 a hearing previously set for September 26 on accounting adjustments to be made by the Arkansas Power & Light Co. The hearing will be held at Washington.

FPC Will Lose Freedom under Reorganization Act

Prospects that the Federal Power Commission might be exempted from terms of the Reorganization Act which Congress will enact soon were not good early this week when Sen. Pat McCarran, Nevada Democrat, disclosed that the Commission is not included among the agencies which a Senate bill is expected to exempt.

FPC had already been denied exemption in the House bill which passed overwhelmingly last week and went to the Senate. McCarran's judiciary subcommittee, working on a new bill, would give somewhat broader exemptions than did the House bill, but the agencies it is planned to exempt did not include FPC.

FPC lost out in the House when it was lumped with seven other similarly-situated agencies in an amendment which would have exempted the entire group. Administration leaders attacked the amendment as "log-rolling" and insisted that if real need for exemption could be shown, amendments could be submitted for each such agency and voted upon separately. Republican strategy refused to accept this, and the amendment was defeated.

MEETINGS

Pennsylvania Electric Association—Communications committee, Roosevelt Hotel, Pittsburgh, Pa., November 1-2. W. H. Lambert, chairman, Pennsylvania Electric Co., Johnstown, Pa.

Oklahoma Utilities Association—Electric Light & Power Division, Mayo Hotel, Tulsa, Okla., November 8. Kate A. Niblack, secretary, 625-626 Biltmore Hotel, Oklahoma City, Okla.

New Jersey Utilities Association—Seaview Country Club, Absecon, N. J., November 16-17. Harry Bacharach, executive director, Atlantic City, N. J.

National Association of Railroad and Utilities Commissioners—National meeting, Deauville Hotel, Miami Beach, Fla., December 4-7. Ben Smart, secretary, 7411-13 New Post Office Bldg., Washington, D. C.

Previously Listed

Edison Electric Institute—Transmission and distribution committee, Cleveland Hotel, Cleveland, Ohio, October 15-16; electrical equipment committee, Cleveland Hotel, Cleveland, Ohio, October 17-18; accident prevention committee, Lord Baltimore Hotel, Baltimore, Md., October 25-26. Col. H. S. Bennion, managing director, 420 Lexington Ave., New York 17, N. Y.

International Association of Electrical Inspectors—Western Section, LaSalle Hotel, Chicago, Ill., October 15-16; F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern Section, Hotel New Yorker, New York, N. Y., October 22-23; F. N. M. Squires, secretary, 85 John St. New York, N. Y. Southern Section, Baker Hotel, Dallas, Texas, October 29-31; A. M. Miller, secretary, 219 Governor St., Richmond 19, Va.

Electrochemical Society—Electronics Division, University of Pennsylvania, Philadelphia, Pa., October 17; Electrodeposition Division, Hotel Pennsylvania, New York, N. Y., October 24. Colin G. Fink, secretary, 3000 Broadway, New York 27, N. Y.

American Welding Society—Annual meeting, Pennsylvania Hotel, New York, N. Y., October 18. M. M. Kelly, secretary, 33 W. 39th St., New York 18, N. Y.

Missouri Valley Electric Association—Fall sales conference, Hotel Continental, Kansas City, Mo., October 18-19; fall accounting conference, Hotel Continental, Kansas City, Mo., October 24-25. I. D. Pettegrew, director, 1004 Baltimore St., Kansas City 6, Mo.

Pennsylvania Electric Association—Transmission and distribution committee, Abraham Lincoln Hotel, Reading, Pa., October 18-19; C. C. Moler, chairman, Potomac Edison Co., Hagerstown, Md. Meter committee, Roosevelt Hotel, Pittsburgh, Pa., October 25-26; B. M. Smith, chairman, Pennsylvania Electric Co., Erie, Pa. Electrical equipment committee, Benjamin Franklin Hotel, Philadelphia, Pa., October 25-26; B. E. Hagy, chairman, Philadelphia Electric Co., Philadelphia, Pa. Systems operation committee, Penn Harris Hotel, Harrisburg, Pa., November 8-9; A. R. Deck, chairman, Metropolitan Edison Co., 412 Washington St., Reading Pa.

Rocky Mountain Electric League—Annual meeting, Shirley Savoy Hotel, Denver, Colo., October 25-27. R. B. Hubbard, manager, Gas & Electric Bldg., Denver 2, Colo.

National Electrical Contractors Association—Annual meeting, Carter Hotel, Cleveland, Ohio, October 29-31. C. J. Harder, national secretary, 633 Investment Bldg., 15th and K. Sts., N. W., Washington, D. C.

International Association of Electrical Leagues—Annual conference, Morrison Hotel, Chicago, Ill., November 1-3. O. C. Small, secretary, 155 E. 44th St., New York 17, N. Y.

American Society of Mechanical Engineers—Annual meeting, Hotel Pennsylvania, New York, N. Y., week of November 25. Ernest Hartford, executive assistant secretary, 29 W. 39th St., New York 18, N. Y.

Southeastern Electric Exchange—Commercial Section, Atlanta Biltmore Hotel, Atlanta, Ga., December 5-7. J. W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta 1, Ga.

Predictions Indicate Fewer Appliances

Predictions as to production of four major electrical appliances contained in the second report on reconversion progress in a group of selected industries show a drop from the levels anticipated in the first report issued by the War Production Board a month ago.

Reporting manufacturers of each appliance "continue to report reconversion difficulties," WPB's report added.

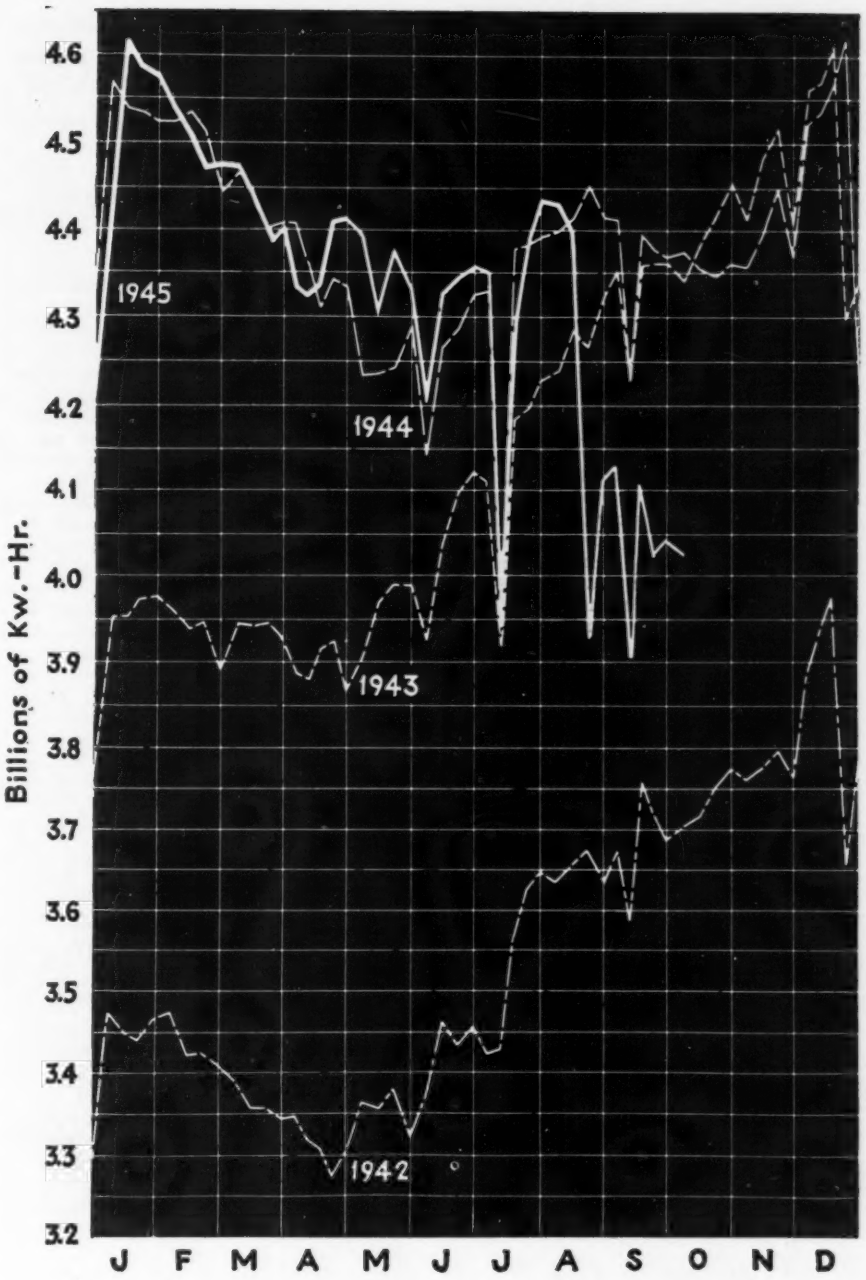
Twenty-nine makers of domestic laundry equipment, representing 95 percent of all production, forecast monthly output of 428,000 units valued at $21,142,000 in June, 1946, according to the second report. The first report saw 28 producers forecast June, 1946, production of 495,000 units valued at $22,044,000.

Twelve manufacturers of domestic mechanical refrigerators foresaw production of 460,000 units per month, valued at $39,347,000, in June, 1946. A month ago, 12 producers forecast June, 1946, output of 474,000 units valued at $41,274,000.

Fourteen makers of domestic vacuum cleaners predicted June, 1946, production of 268,000 units valued at $8,821,000, whereas a month ago, sixteen producers predicted an output of 272,000 units valued at $9,100,000 for the same time.

Sixteen electric range makers foresaw June, 1946, production of 92,000 units valued at $7,153,000. A month back, sixteen producers foresaw June, 1946, production of 97,000 units valued at $7,535,000.

In presenting the data, WPB warned that "Comparisons with the first report will be erroneous since the industries and the companies selected are not the same in all cases."



Electric Output Curve Turns Downward

The electric output curve moved slightly downward during the week ended October 6, 1945, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry totaled 4,028,286,000 kw.-hr., compared with 4,038,542,000 kw.-hr. during the preceding week. During the week ended October 7, 1944, the amount of electrical energy distributed amounted to 4,375,079,000 kw.-hr., this year's figure representing a decrease of 7.9 percent.

All of the seven major geographical regions of the country reported losses as compared with the corresponding week of last year, with the exception of the Rocky Mountain States, which reported an increase of 1.6 percent.

Weekly Output Millions Kw.-Hr.

1945		1944		1943	
Oct. 6	4,028	Oct. 7	4,375	Oct. 9	4,342
Sept. 29	4,039	Sept. 30	4,366	Oct. 2	4,359
Sept. 22	4,019	Sept. 23	4,377	Sept. 25	4,360
Sept. 15	4,106	Sept. 16	4,395	Sept. 18	4,359
Sept. 8	3,909	Sept. 9	4,228	Sept. 11	4,229
Sept. 1	4,137	Sept. 2	4,415	Sept. 4	4,351
Aug. 25	4,116	Aug. 26	4,418	Aug. 28	4,322
Aug. 18	3,939	Aug. 19	4,451	Aug. 21	4,265
Aug. 11	4,395	Aug. 12	4,415	Aug. 14	4,288
Aug. 4	4,432	Aug. 5	4 399	Aug. 7	4,241
July 28	4,435	July 29	4,391	July 31	4,227
July 21	4,385	July 22	4,381	July 24	4,196

Percent Change from Previous Year

	Week Ending		
	Oct. 6	Sept. 29	Sept. 22
New England	— 3.1	— 3.5	— 4.4
Mid Atlantic	— 3.9	— 2.6	— 4.2
Central Industrial	— 11.4	— 11.0	— 12.3
West Central	— 1.0	— 0.6	— 2.0
Southern States	— 11.1	— 9.7	— 10.6
Rocky Mountain	+ 1.6	+ 3.3	+ 3.1
Pacific Coast	— 6.0	— 8.1	— 5.9
Total United States	— 7.9	— 7.5	— 8.2

Quebec Power Will Sell $2,000,000 Mortgage Bonds

Quebec Power Co. will issue $2,000,000 of first mortgage and collateral trust series D 3½ percent bonds maturing September 1, 1962. An unsold balance of $452,000 of series C bonds previously authorized by the Quebec Public Service Board and held in the company's treasury may be cancelled. The new bonds may be sold at not less than 98 and accrued interest.

The money from the sale of the bonds will be used to replace treasury funds amounting to $2,500,000 used for capital expenditures since 1937 and to meet further capital expenditures.

SEC DECISIONS—HEARINGS

The Securities and Exchange Commission recently issued a series of orders affecting electric utility companies.

STANDARD GAS & ELECTRIC CO.'s proposed sale of its interest in a wholly. owned Mexican subsidiary to William Rosenblatt, a non-affiliate, for $640,000, was not approved by the commission on the ground that "competitive conditions" had not been maintained, Mr. Rosenblatt, acting as agent for Credito General de Mexico, S. A., a Mexican financial corporation, had offered the $640,000 for the 50,000 shares of capital stock and an open-account indebtedness of $428,495, which Standard Gas & Electric holds in Impresa de Servicios Publicos de Loas Estados Mexicanos, S. A. Because the amount involved was less than $1,000,000, compliance with the commission's competitive bidding rule was not required. However, the commission maintained that Standard was under a duty to see that competitive conditions were maintained. The commission declared a "series of mistakes, alterations, changes in conditions, modifications and extensions so confused the procedure . . . that we cannot conclude that competitive conditions were maintained. From any point of view, it seems clear to us that the past transactions should be erased and an orderly procedure of sale be established."

AMERICAN UTILITIES SERVICE CORP.'s proposal to sell to Harris Trust and Savings Bank of Chicago a secured note in the principal amount of $2,000,000 has been approved. "Since the proceeds, together with other funds, are to be used by American in refunding its presently outstanding collateral trust bonds in the principal amount of $2,200,000, the proposed issue and sale of the note qualifies under Clause (a) of Section 7 (c) (2) of the Holding Company Act," the SEC ruling pointed out. American Utilities Service's bonds are to be called at 104½ percent, plus accrued interest.

Applications Filed

CENTRAL NEW YORK POWER CORP. a Niagara Hudson Power subsidiary, has requested commission authority to purchase in the open market from time to time, during a one-year period, an additional $1,000,000 principal amount of Utica Gas & Electric Co. refunding and extension mortgage, 5 percent fifty-year bonds, due July 1, 1957, at prices not to exceed 135 percent of the principal amount. Authorization to purchase a similar amount of the Utica bonds was granted by the commission last April.

CENTRAL MAINE POWER CO. has asked the commission to sanction its proposal to sell to the Maine Seaboard Paper Co. for $200.000 a steam turbine generator and auxiliary apparatus, which it installed in Seaboard's paper mill at Bucksport, Me., in June, 1936. Both companies are subsidiaries of the New England Public Service Co.

COLUMBUS & SOUTHERN OHIO ELECTRIC CO. has registered 133,745 shares of $100 par value cumulative preferred stock, 4½ percent series, which are to be offered, share for share, in exchange for 83,601 outstanding first preferred 6 percent shares and 50,144 outstanding Series B 6½ percent preferred.

WISCONSIN POWER & LIGHT CO. has filed a recapitalization plan which would reduce the amount of its outstanding preferred stock to $12,000,000 from $16,766,300 and increase its common stock to an amount substantially equal to the preferred. To assist the company in carrying out the plan, the North West Utilities Co., parent, will purchase from Wisconsin at par an additional $4.5 million par value common stock. North West now owns 97.12 percent of the Wisconsin common. Wisconsin Power & Light will use the proceeds from the sale and treasury funds to call for redemption at $110 and accrued dividends $4,766,300 of its preferred stock. Wisconsin has filed a registration statement with the SEC, covering 120,000 shares of 4½ percent cumulative preferred which will be offered to holders of the 167,663 shares of outstanding 6 percent and 7 percent cumulative preferred stock prior to the proposed redemption of the $4,766,300 preferred. The exchange will be made on a share for share basis with a cash adjustment.

Hearings Scheduled

OCTOBER 15: On proposal of Niagara Hudson Power Corp. to effect the merger of Union Bag & Paper Power Corp. into New York Power & Light Corp. Both companies are subsidiaries of Niagara Hudson. In connection with the merger, New York Power will issue to Niagara Hudson 150,000 shares of its common stock, no par value, having an aggregate stated value of $4,256,749, in exchange for all the outstanding capital stock of Union, consisting of 5,000 shares of no par value common stock having a stated value of $4,256,740.

OCTOBER 17: On proposal of Niagara Hudson Power Corp. to merge Northern Development Corp. into Central New York Power Corp. in connection with which Central New York will issue 250,000 shares of no par value common stock having an aggregate stated value of $18,200,000, to Niagara Hudson in exchange for all the outstanding capital stock of Northern, consisting of 182,000 shares having a stated value of $18,200,000.

OCTOBER 23: On proposal of Ogden Corp. to reduce the par value of its common stock from $4 a share ($13,614,653) to 50 cents a share ($1,701,832), and to transfer reduction of $11,912,821 to capital surplus. Ogden also proposes to distribute to its common stockholders a dividend of $3 a share in cash, aggregating $10,210,989, charging the distribution to earned surplus to the extent of such surplus and the remainder to capital surplus.

OCTOBER 24: On recapitalization plan filed by the Interstate Power Co., a subsidiary of Ogden Corp., to comply with Section 11 (b) of the Public Utility Holding Company Act.

UTILITY REPORTS

	Net Income 1945	1944
*Alabama Power	$3,884,916	$4,150,050
*Central Arizona Light & Power	818,820	735,779
*Consolidated Gas Elec. Lt. & Pwr. (Balto.) and sub	6,728,035	6,662,179
*Consumers Power	7,081,090	7,501,293
*Georgia Power	4,889,509	5,122,589
*Iowa Public Service	650,858	673,643
*Iowa Southern Utilities	322,591	360,433
*Ohio Edison	3,543,818	3,574,416
*Sierra Pacific Power	559,833	574,162
*Sioux City Gas & Electric	665,916	634,915
*Tampa Electric	1,251,772	1,218,573
*Utah Power & Light and sub	1,280,730	1,852,710

*Twelve months ended August 31.

Brotherhood Recognized as Bargaining Agent

The International Brotherhood of Electrical Workers has been certified by the National Labor Relations Board as bargaining agent for specified employees of two electric utilities.

I.B.E.W. won an election by 35 to 1 and was certified as bargaining agent for all production and maintenance employees of the Oil City station of the Pennsylvania Electric Co.

All operation, production, distribution, service and maintenance employees of Toledo Edison Co. will be represented by I.B.E.W. as a result of an election resulting from an action brought by the Utilities Workers Organizing Committee (C.I.O.). The U.W.O.C. brought the complaint in March despite the existence of a contract the company had maintained with the I.B.E.W. since 1937. The company refused to recognize the U.W.O.C. on the basis of the contract. When the I.B.E.W. intervened, an election was ordered with the I.B.E.W. winning 491 to 151. Recently it was certified as bargaining agent.

The board also extended through the first week in October the time during which an election shall be held to determine whether the I.B.E.W. shall be recognized as exclusive bargaining agent for employees of the Southern California Edison Co.

H. E. Gove Plans to Return to Union Electric Co.

Maj. Harold E. Gove, chief of the power, communications and water sections, Headquarters, Army Service Forces, and Army representative to the Office of War Utilities for several years, expects to be returned to inactive duty this week and return to the Union Electric Co. of Missouri.

A reserve officer, Maj. Gove was called to extended active duty early in the war and has been doing utilities work for the Army since February 15, 1942.

How

DESIGN · CONSTRUCT · OPERATE · MAINTAIN

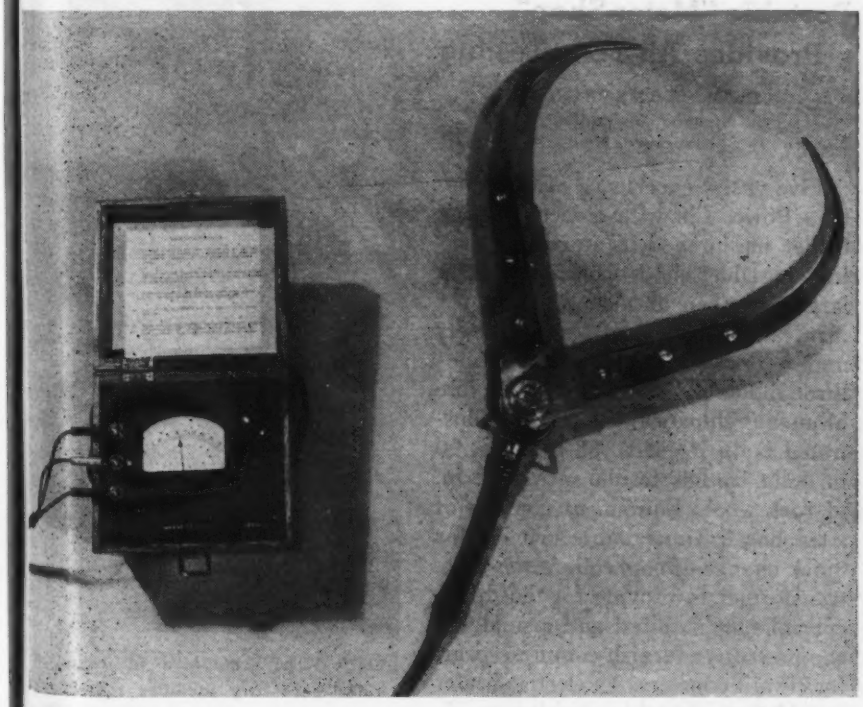
Electric Calipers Gage Pile Sizes

R. G. FINNERTY
Transmission and Distribution Department, Boston Edison Co.

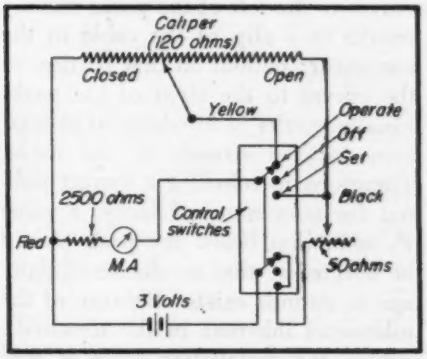
Inspection by a specially trained diver is required to determine the extent of deterioration caused by wood-destroying marine growths in wood piling supporting wharves, docks, warehouses, etc. Such inspections are simplified and made more accurate and acceptable for legal purposes by the use of the remote indicating calipers here shown.

In practice the diver is required to determine the diameters of each pile at three points: the mud line, low water line and halfway between. The diver sets the calipers at each of these points, identifying each pile and the location of the measurement by telephone connection with an attendant in a boat on the surface. The attendant reads on the meter the caliper opening (pile diameter) in inches. The maximum opening of the calipers is 18 in.

The calipers are submersible and are connected with the meter box by a waterproof cord. One of the caliper arms moves the slider of a rheostat mounted within a housing, and this varies the current in the meter in accord with the caliper opening.



CLOSE-UP OF MARINE CALIPERS and milliammeter calibrated in inches to indicate pile diameters by underwater measurements



WIRING DIAGRAM for marine caliper set for measuring pile diameters

In order to obtain uniform scale readings the potential drop from one end of the rheostat to the other is measured by a fixed current through the rheostat winding. A current adjusting rheostat with a check switch is included in the set-up. Two No. 6 dry cells in the meter box supply the necessary test potential.

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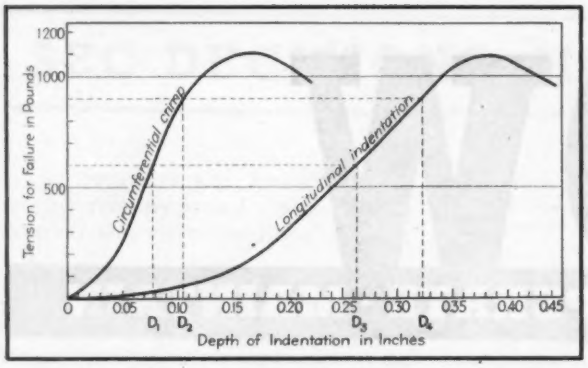
Crimp vs. Indentation for Cable Connections

JULIAN ROGOFF
Assistant Chief Engineer Burndy Engineering Co., New York

As an indication of the relative merits of connections installed by circumferential crimp or longitudinal indentation, pullout can be used as a measure of value. Using identical connectors and cable for each test, a curve can be drawn by plotting values of pullout versus the depths of indentation of the longitudinal punch, and similarly a curve can be drawn by plotting values of pullout versus the depths of indentation of the circumferential dies. See illustration.

Pullout on that portion of the



COMPARISON OF VARIATION of depth of indentation permissible for longitudinal indent and circumferential crimp as applied to electrical connectors and cable

curves to the left of the peaks usually results in a slip of the cable in the connector; pullout on that portion of the curves to the right of the peaks usually results in breakage of at least some of the strands of the cable. Therefore, in selecting a correct pullout for maximum efficiency, a value P_1 somewhat below the peak should be selected so that no chance of damage to strands exists. Because of the tolerances inherent in the terminals, cables and installation tools as well as the wear of the installation tools, a minimum value P_2 of pullout should also be selected. Thus a cable connection, properly made, will have a minimum pullout of P_2 and a maximum pullout of P_1.

A reference being made to the two curves shows that the depth of crimp or indentation required to obtain pullout values between P_1 and P_2 varies between D_1 and D_2 for the circumferential crimp and varies between D_3 and D_4 for the longitudinal indentation. The difference between D_3 and D_4 is approximately three to four times that between D_1 and D_2 indicating that the permissible variation in depth to compensate for wear and tolerance is three to four times as great for the longitudinal indentation as for the circumferential crimp—a very important advantage.

Area in Contact

As a longitudinal indentation is formed, the area of the terminal in contact with the strands actually increases, so that the final area in contact is approximately 10 percent greater than the original area. On the other hand, the circumferential crimp actually shrinks the amount of area in contact with the strands by approximately 20 percent. This is an especially important factor where aluminum cable is concerned, since the more strands that come into direct contact with the connector barrel, the less detrimental is the effect of transverse resistance within the cable.

As the longitudinal indentation is made into the cable connection, the strands are forced to shift and rearrange themselves. This causes the strands to exert a "wiping" action on each other, thereby tending to clean the oxide film off the surfaces of the strands. A circumferential crimp does not have this advantage; the strands are merely squeezed tighter in the same relative position to each other.

Also, a smaller amount of pressure is required to make the longitudinal indentation. This means that smaller, more convenient tools can be used to install the terminals.

Thus, it is apparent that a longitudinal indentation presents definite and important advantages over a circumferential crimp for making electrical cable connections.

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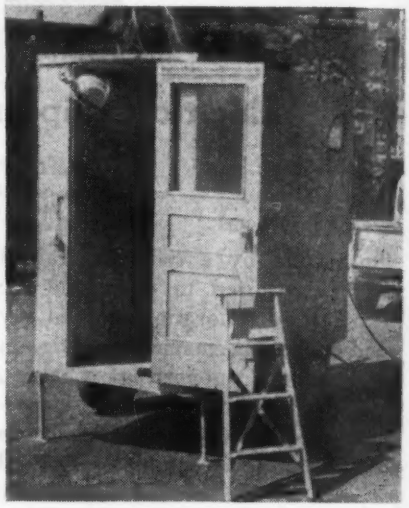
Portable "Meter Shop" Provides All-Year Testing

E. M. ARMSTRONG
Montana Power Co.,
Lewistown, Mont

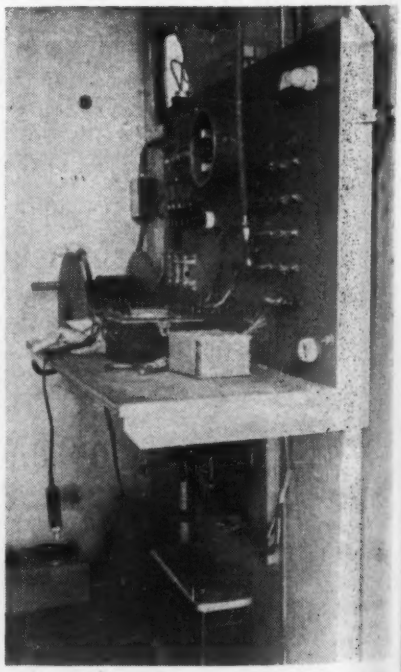
Five years' experience of the Montana Power Co. with a meter testing trailer has proved its worth in making possible shop workmanship, a larger number of meters tested per man, and a means of testing meters under good working conditions throughout the year in the severe Montana climate. The trailer illustrated is 46 in. wide, 86 in. high, 90 in. long, and is insulated with 2 in. of rock wool. Equipment consists of a test board with suitable switches for quick change of connections, an autotransformer to provide for the different voltages required and a small air compressor to furnish compressed air for cleaning meters. An electric heater provides comfortable working conditions during the winter.

Power is supplied to the trailer through 100 ft. of two No. 10 heavy duty all-rubber cable. The cable is held on a small wooden reel mounted toward the front end of the trailer and is unwound through a bushed ¾-in. opening to allow it to be pulled to a convenient meter socket.

When the meters are removed for testing, a blank meter base with jumpers between the blades is used to give the customer service while meters are being tested. Where meters are



METER TESTING trailer provides shop workmanship, more meters tested per man and all-year testing under severe climatic conditions as in Montana



TEST BOARD mounted in trailer provides necessary facilities for doing a shop meter testing job in the field. Note the cable reel at end of bench and the autotransformer and heater below

scattered, a light truck is used to bring them to the trailer. In rural areas where the meters are considerable distances apart the trailer has been found quite satisfactory, as the time required for connecting, leveling and disconnecting the trailer would average less than 10 min. It has been found possible to test and do a good job up to 40 meters a day with two men.

Experience indicates that it would have been better to have built the trailer a little larger to provide room for an extra bench.

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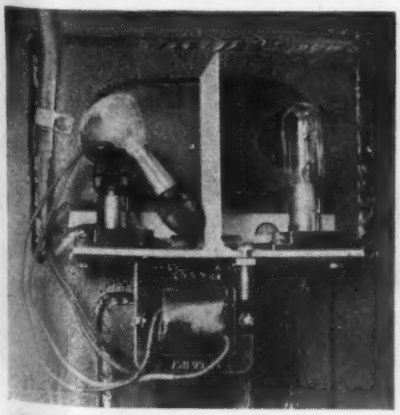
Prolonging Life of Network Indicator Lamps

Frequent burnout of indicating lamps in network protectors on the Pacific Gas & Electric, Oakland, underground system has been eliminated by replacing the fragile switchboard-type lamps with automobile headlight lamps fed from a bell ringing transformer.

Although lamps supplied by the manufacturer are rated 160-175 volts and burn on a 120-volt circuit, nevertheless the lamp back of the red indicator glass that burns practically continuously is short lived, probably due to vibration from the transformer and the rather fine filament. C. F. Cooper, operating foreman of P. G. and E., suggested using a standard 6-8-volt automobile headlight bulb fed from a bell ringing transformer.

Installation as illustrated was made on six network protectors in August 1942, and in the ensuing three years only one lamp burnout has occurred. Primary of the bell transformer is fed by inserting a standard two-contact automobile wiring plug into the bayonet case supplied for the regular indicator lamp. Secondary leads terminate in a two-point socket which takes the two-filament headlight lamp. Since current is thus supplied only to the two contacts on the lamp, the filaments burn in series at half-voltage, thus further prolonging life of the shock-proof coiled filament headlight.



AUTO HEADLIGHT supplied by bell transformer eliminates burnouts of network protector indicator lamps

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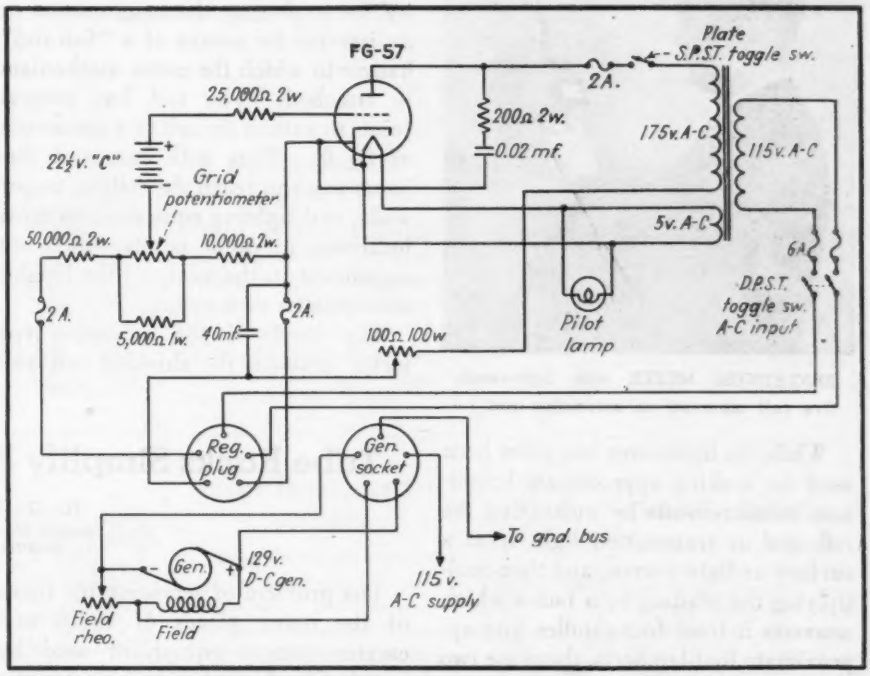
Electronic Regulator for Charging Generator

C. D. PRICE
Electrical Engineer
Columbus & Southern Ohio Electric Co., Columbus, Ohio



ELECTRONIC VOLTAGE REGULATOR provides automatic regulation of motor-generator set used to float-charge station control batteries

Automatic regulation of motor-driven shunt generators used on the system of Columbus & Southern Ohio Electric Co. to float-charge 60-cell station control batteries is secured with an electronic-type generator voltage regulator circuit, arrangement of which is shown in the accompanying illustration.

In this regulator the grid-control FG-57 tube acts as a valve permitting more current to flow through the generator field winding when the voltage across the battery drops slightly or weakening the generator field current when voltage across the battery exceeds a preset value.

The principle employed is not new. Other devices of this type have been built; however, the circuit shown was considered most satisfactory for this application and to date has performed very satisfactorily.

Sequence of steps in placing the regulator in service are as follows: With the plate circuit switch of the regulator open close the a.c. input switch and allow the tube to heat for ten minutes. Bring the generator voltage up to a level just above the battery voltage before closing the plate circuit switch. Set the grid potentiometer to zero and adjust it until generator voltage is 129 volts (for 60-cell battery). Close the generator switch to the battery and readjust the potentiometer so that the battery floats at 129 volts.

To remove the regulator from service the generator voltage should be increased by means of the hand rheostat until the regulator stops functioning, as evidenced by disappearance of the blue-glow in the tube. The plate circuit switch is then opened and the a.c. supply switch on the regulator also opened completing the operation.

New Meters Simplify Brightness Studies

K. A. STALEY,
La Salle Extension University
Chicago, Ill.

BRIGHTNESS METER with light-sensitive cell mounted on extensible rod

While the lightmeter has often been used for making approximate brightness measurements by measuring the reflected or transmitted light from a surface or light source, and then multiplying the reading by a factor which converts it from foot-candles into approximate foot-lamberts, there are two fundamental limitations to its use for that purpose:

1. The sensitivity of the moving element is too low to give satisfactory indications of reflected light from darker objects.
2. The lightmeter cell requires a shielding device or hood in order to limit its viewing angle.

Obviously a more sensitive microammeter, a more sensitive cell, or a combination of the two, will overcome these limitations, while the necessity of shielding the instrument to exclude extraneous light from wide angles increases the need for higher sensitivity of the instrument. Two new experimental designs recently shown by the engineering division of General Electric's lamp department make use of a microammeter and cell combination, which has approximately ten times the sensitivity of the standard lightmeter. These instruments, even though hooded, will give readable brightness deflections as low as 1 or 2 foot-lamberts.

One of these brightness meters would have the same appearance and dimensions as the standard lightmeter, except that it would have a shielding attachment and would be calibrated with the attachment to read in foot-lamberts. Although more sensitive than the standard lightmeter it could be so used without the attachment through the use of a multiplier to bring it immediately into the range of any commercial lighting level which it is desired to measure.

The other meter has increased utility for exploring the brightnesses of an interior by means of a "fish-rod" handle to which the meter mechanism is attached. The rod has several joints to extend the cell to a maximum of 5½ ft. Thus with ease and dispatch one can reach the ceiling, upper walls, and lighting equipment in most locations, or other points which are significant in the study of the brightness pattern of a room.

The head of the extension-type meter contains the shielded cell and is mounted on a movable bracket which allows for readings at any angle, since it can be turned 270 deg. or more. Thus readings in consequential areas or points about a luminaire or floor lamp whose brightness limits are fixed by "code," such as in the Illuminating Engineering Society performance specifications, can be read quickly and reasonably accurately.

The "fishpole" meter can by poking the cell into machines be used in industrial interiors to measure workpoints heretofore inaccessible. In outdoor sports lighting, the long unit should make the reading foot-candle values at high points, usually made with an extension servicing truck, easier.

The lighting industry should be able to establish brightness limits for seeing comfort in all fields more quickly by using these meters widely and intelligently. They should be obtainable soon after the release of critical materials.

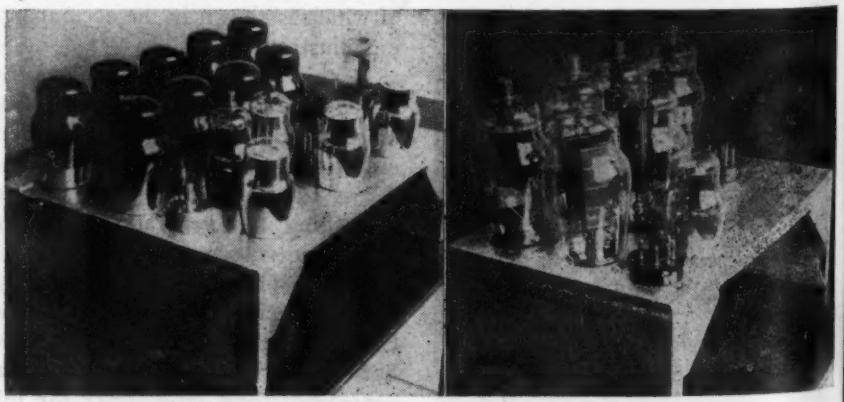
• • •

Tube Racks Simplify Radio Servicing Problem

H. G. SILLIMAN,
Senior Electrical Engineer
Seattle City Light

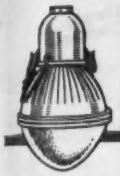
The problem of servicing the tubes of the many pieces of radio and carrier current equipment used by Seattle City Light has been materially reduced by use of the tube racks illustrated. The city has in operation 24 two-way radio equipments and seven channels of carrier communication, telemetering and relay circuits. To insure that service men always had with them the right complement of tubes became quite a problem.

Each rack contains a complete set of tested tubes for one shelf or one cabinet, as the case requires. All of the tubes in a piece of equipment may be changed at one time and the testing done when convenient, thus restoring service in a very minimum of time. Racks of tested tubes are stored near the equipment in which they are to be used. The investment tied up in these sets of spare tubes is insignificant considering the importance of the equipment involved.



RACKS CONTAINING A COMPLETE SET of tubes are placed convenient to radio and carrier current equipment to simplify tube servicing problem and insure quick restoration of service. Investment in spare tubes is considered insignificant

COMBINES all the economy factors and lights all kinds of streets



THE LONG-LIVED FORM 79 LUMINAIRE meets the various illumination needs of all your streets. It conforms to your standard installation practices. It is adaptable to your normal maintenance procedure. And—it accomplishes all these things in a single, basic, low-cost design.

LESS BREAKAGE

Breakage, as well as light loss from dirt accumulation, is reduced because the reflector and globe are spun-sealed together into a single unit. A gasketless, pressure seal joins the reflector and hood.

VARIETY OF LIGHT DISTRIBUTIONS

With the choice of four types of light control, you can have a safe level of light on streets of any type and width, at spacings that afford savings in equipment investment.

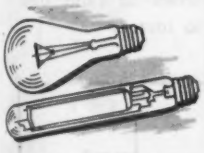
ANY POWER SUPPLY

The Form 79 is available with sockets for multiple, straight-series, or series-with-insulating-transformer operation. All are properly and rigidly mounted to assure the correct and permanent focus of the lamp in its reflector.

EASY RELAMPING

To reach the lamp, just unlatch the spun-sealed reflector from the hood. A sturdy chain suspends the reflector from the hood during servicing. For inaccessible spots, two alternate types of detachable globe holders can be used.

CHOICE OF LIGHT SOURCE



Form 79 is not limited to regular tungsten-filament lamps. If you want the economy plus the attractive color of long-life Mazda-H mercury lamps (either 250 or 400 watt) the Form 79 is equally applicable.

HIGH INSULATION VALUES

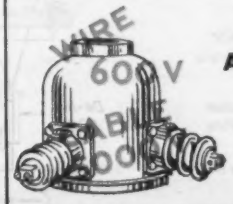
Liberal use of the highest-grade porcelain, in the metal hood, provides high insulation values. But if you prefer porcelain insulator heads on straight-series circuits, this G-E Novalux line includes them.

GOOD LOOKS

Where decorative considerations favor it, an artistically proportioned long globe can be employed on Form 79-S or -D luminaires, in place of the standard, short globe or prismatic refractor. Also, dark green enamel finish is optional in place of natural aluminum.

VERSATILE SUSPENSION

Form 79 is supplied for both top and side mounting. Top-tapped hoods allow mounting with the conventional types of pipe brackets, mast arms, and hangers. Side-mounting, slip-fitter hoods offer you the advantages of higher mounting and easier installation and wiring.



ALL WIRING METHODS

Form 79 hoods and porcelain insulator heads cover the entire range of wiring methods—insulated cable inside or outside the supporting brackets; or ordinary line wire to exterior or interior terminals. It's easy to get good solid connections.

APPLICATION AID

G-E specialists are at your service if you need help in selecting the right Form 79 for your needs. Bulletin GEA-2276E, just off the press, is packed with answers to your questions about this luminaire. Ask your G-E office or write Apparatus Dept., General Electric Co., Schenectady 5, N.Y.

GLOBE REPLACEMENT. Our exchange plan for damaged units provides fully reconditioned and modernized reflectors as well as new glassware, for little more than the cost of glassware alone.

GOOD STREET LIGHTING BUILDS GOOD WILL

NOVALUX FORM 79

BUY WAR BONDS ★

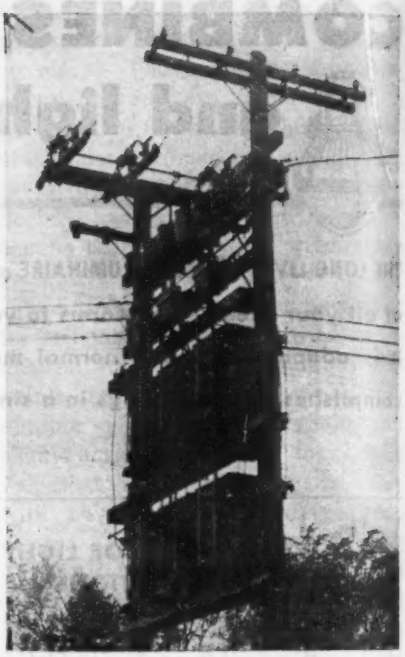
GENERAL ELECTRIC

Compact Pole-Type Substation Layout

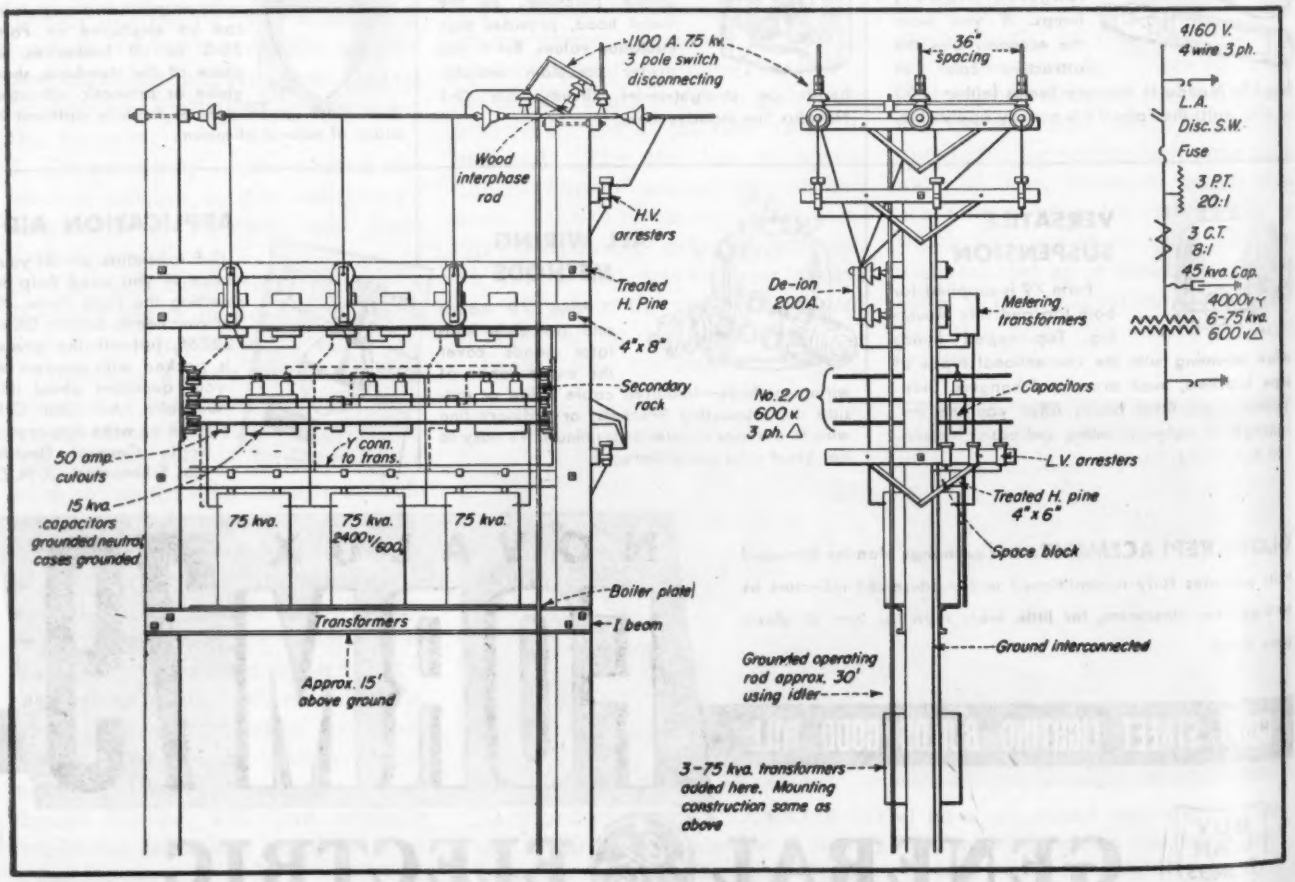
An eastern manufacturing plant engaged in special machinery production with but a minor portion of its work on government contracts was served by a pole-type substation designed by the supplying utility, as illustrated. The substation was designed primarily to furnish 225 kva. to the machine shop from a 4,160-volt Y-connected three-phase feeder at the end of a regulated circuit. The initial installation comprised one bank of three 75-kva. transformers delivering 600-volt energy to a three-phase delta secondary rack, three 15-kva., 4-kv. Y-connected capacitors being mounted on the pole structure for power-factor regulation. Current and potential transformers for high-side metering were mounted outdoors, and the metering connections carried into the mill offices by overhead cable, combination metering equipment being located in the superintendent's office to give a permanent and graphic record and continual indication of load conditions.

The plant became occupied 100 percent with war work soon after the above installation was made, and a second set of transformers aggregating 225 kva. was added by mounting these units on a platform of ½-in. boiler plate, 10 ft. long by 26 in. wide, carried on two 3-in. by 7-in. I-beams attached to the two 40-ft. poles supporting the entire substation facilities. Two separate buildings about 500 ft. apart comprise the plant.

Here the pole layout enables the capacity of the incoming power facilities to be doubled at relatively small additional cost. Pole-type disconnects and De-ion fuses, with lightning arresters cover the protective features, no circuit breakers being provided at the substation. Because of war conditions the two transformer banks were installed at different times, the second bank being supplied by the government. Indoor capacitors will replace the present outdoor units in due course. Space economy with proper clearances features the job.

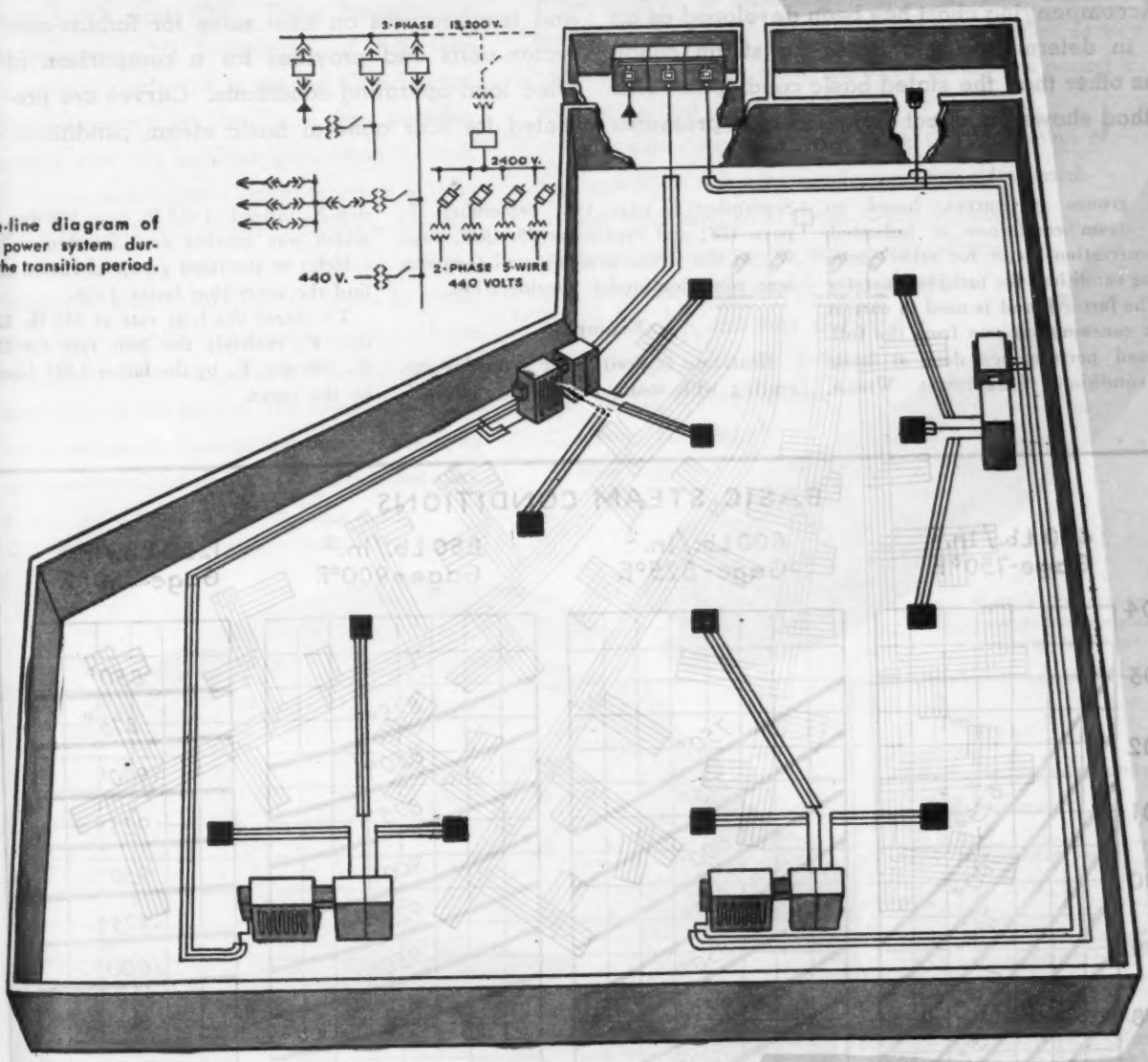


PERSPECTIVE view of 450-kva. substation built for support by two 40-ft. poles, with high-voltage metering transformers near top of structure, cable at upper right to combination demand, watt-hr. and rkva.-hr. meter placed in superintendent's office, with capacitors and transformer banks below. Overhead secondary mains shown at right and left center leading to factory



ELEVATIONS OF POLE-TYPE SUBSTATION, with single-line circuit diagram of service at upper right

FOR GROWTH



One-line diagram of the power system during the transition period.

New feeders (black) will replace the old feeders (yellow) and establish a simplified, modern distribution system.

GENERAL ELECTRIC

321-42-5900

LOAD-CENTER POWER DISTRIBUTION SYSTEMS

HOW TO OBTAIN HEAT RATE FOR VARIOUS STEAM CONDITIONS

F. K. FISCHER and J. R. CARLSON, Central Station Steam Engineering,
Westinghouse Electric Corp., South Philadelphia, Pa.

Accompanying chart has been developed as an aid in determining heat rates for steam conditions other than the stated basic conditions. This method shows the effect of deviation in pressures and temperatures on heat rates for turbine-generator units and provides for a comparison of rated load operating conditions. Curves are presented for four general basic steam conditions.

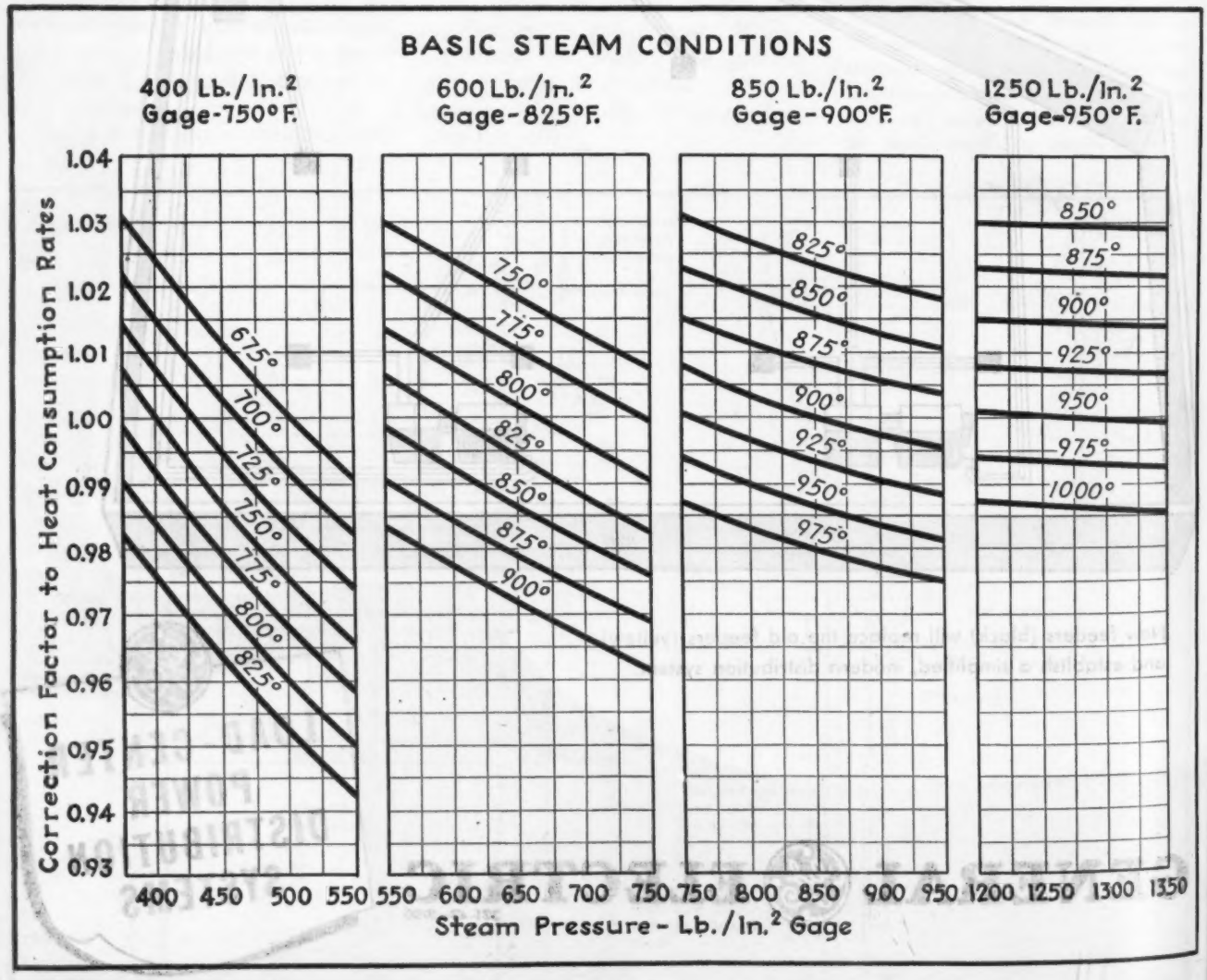
Four groups of curves, based on specific steam conditions as indicated, give a correction factor for other steam operating conditions for turbine-generator units. The factor found is used to correct the heat consumption rate from the full-rated load performance data at basic steam conditions (ELECTRICAL WORLD, September 1, page 116; September 15, page 128; and September 29, 1945, page 98) to the steam pressure and temperature condition under consideration.

Example

Heat rate is desired for a turbine operating with steam at 825 lb. gage, 825 deg. F., instead of 850 lb. gage, 900 deg. F. which was another consideration.

Refer to the third group of curves and find the correction factor 1.026.

To obtain the heat rate at 825 lb. 825 deg. F., multiply the heat rate for 850 lb., 900 deg. F., by the factor 1.026 found on the curve.



FIVE YEARS *without* A SERVICE FAILURE

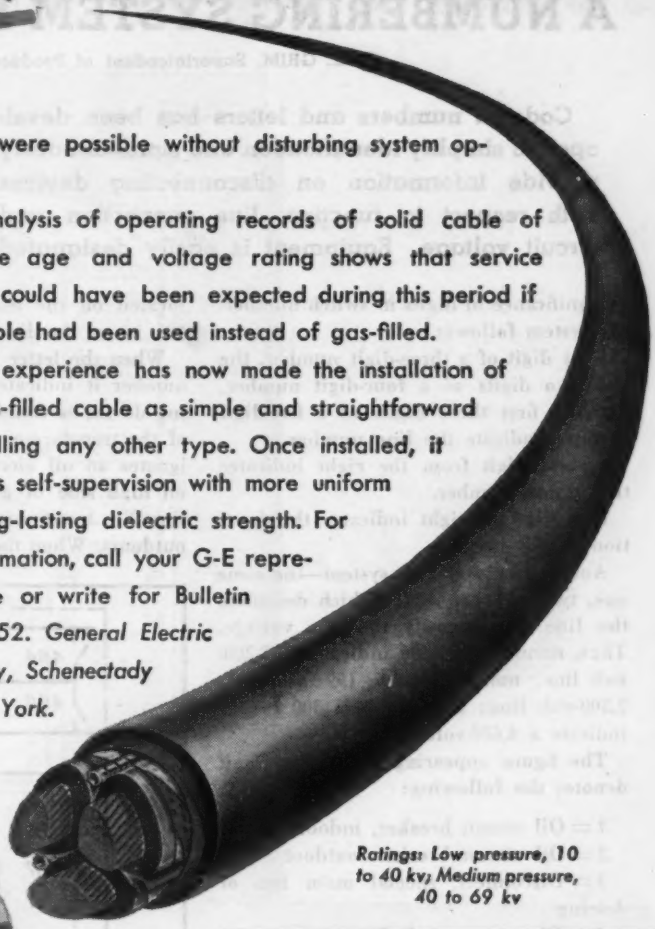
FIVE years ago, G-E gas-filled cable was selected for two important 27-kv feeders under New York's East River. These feeders are among some 20 installations of this self-supervising cable put in by the Consolidated Edison Company of New York, Inc., including several vital ties between generating stations.

"No service failures have occurred in any of the 138,000 feet of gas-filled cable installed on the system," states an A.I.E.E. article.* Wherever sheath damage or leaks in cable joints or terminals have developed, it has been possible to maintain gas pressure and continue operation of the feeder. The location of leaks has been quickly determined by pressure-drop measurements and gas-flow direction indicators. Repairs were possible without disturbing system operation.

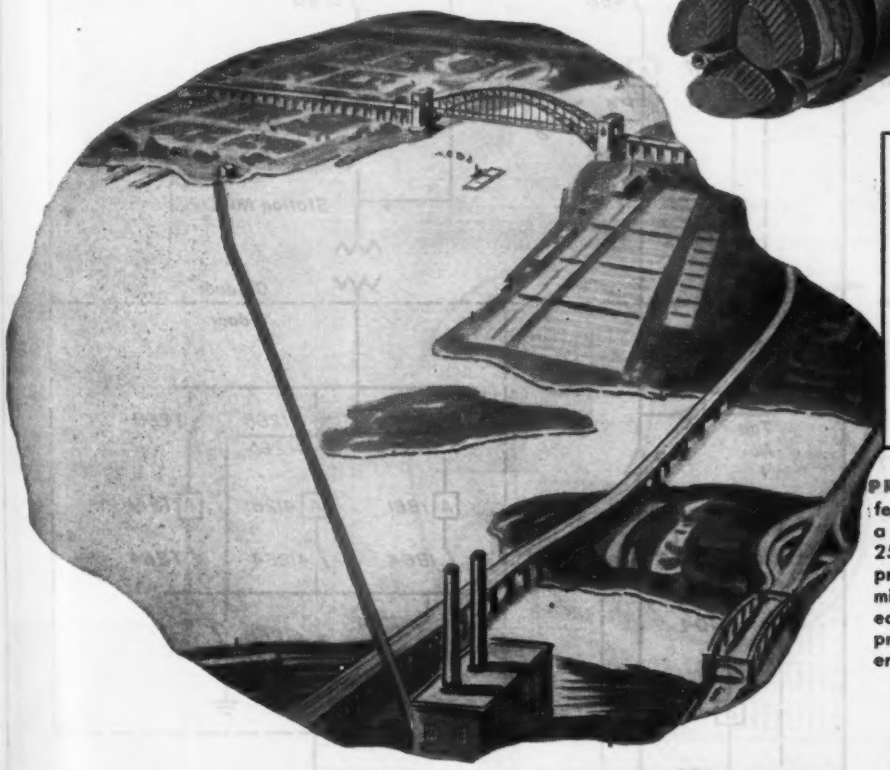
An analysis of operating records of solid cable of the same age and voltage rating shows that service failures could have been expected during this period if solid cable had been used instead of gas-filled.

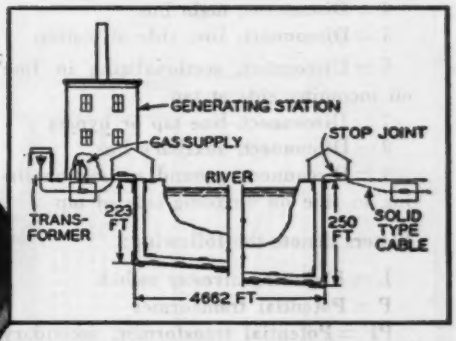
Field experience has now made the installation of G-E gas-filled cable as simple and straightforward as installing any other type. Once installed, it combines self-supervision with more uniform and long-lasting dielectric strength. For full information, call your G-E representative or write for Bulletin GEA-3652. *General Electric Company, Schenectady 5, New York.*

*—*Operation of Low-pressure Gas-filled Cable,* C. T. Hatcher, ELECTRICAL ENGINEERING, Nov., 1944



Ratings: Low pressure, 10 to 40 kv; Medium pressure, 40 to 69 kv





PROFILE NO PROBLEM— The two 3-conductor feeders of 500,000-cm gas-filled cable installed in a tunnel under the East River have vertical risers of 250 and 223 feet at the ends. Yet the installation presented no difficulties that were due to compound migration. A simple nitrogen-gas cylinder connection, equipped with a warning pressure relay, maintains pressure throughout the cable run from the generating station.

BUY ALL THE BONDS YOU CAN—AND KEEP ALL YOU BUY

GENERAL ELECTRIC

GAS-FILLED CABLE

A NUMBERING SYSTEM FOR SWITCHING DEVICES

O. E. GRIM, Superintendent of Production, Edison Light & Power Co., York, Pa.

Code of numbers and letters has been developed to simplify identification and simultaneously provide information on disconnecting devices with respect to function, line connection and circuit voltage. Equipment is easily designated by the load dispatcher or operator to the line crew foreman or station maintenance crew. The numbering system outlined here is used on the Metropolitan Edison Co. system, and is being put into use on the Edison Light & Power Co. system.

Significance of digits in switch numbering system follows:

First digit of a three-digit number, the first two digits of a four-digit number, and the first three digits of a five-digit number indicate the line number.

Second digit from the right indicates the station number.

Last digit at right indicates the function of the switch.

Another feature of the system—the same one, two or three digits which designate the line also identify the line voltage. Thus, numbers 1 to 99 indicate a 13,200-volt line; numbers 100 to 199 indicate a 2,300-volt line; and numbers 300 to 399 indicate a 4,600-volt line.

The figure appearing in the last digit denotes the following:

1 = Oil circuit breaker, indoor
2 = Oil circuit breaker, outdoor
3 = Disconnect, special main bus or deicing
4 = Disconnect, main bus
5 = Disconnect, line side at station
6 = Disconnect, sectionalizing in line on incoming side at tap
7 = Disconnect, line tap or bypass
8 = Disconnect, auxiliary bus
9 = Disconnect, ground or sectionalizing in line on outgoing side of tap

Letters denote the following:

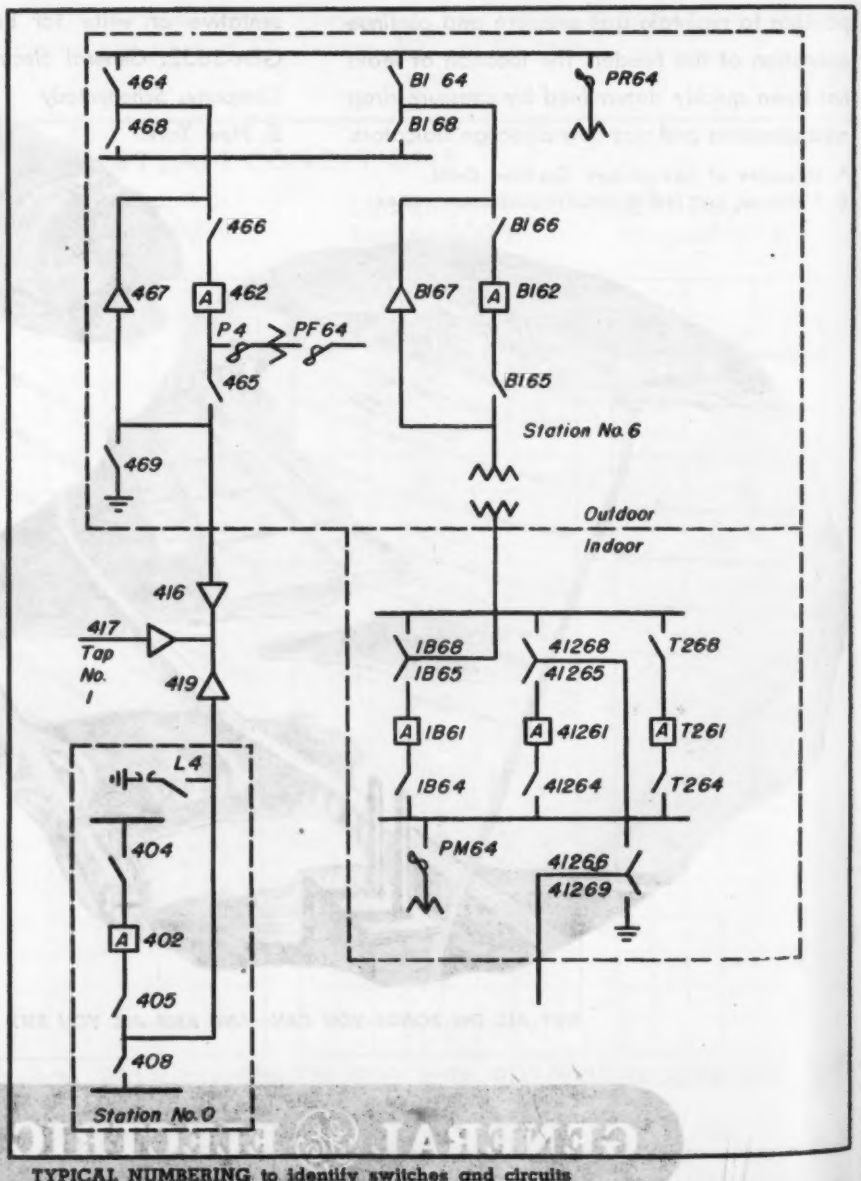
L = Lightning arrester switch
P = Potential transformer
PF = Potential transformer, secondary fuse
PR = Potential transformer, fuse, relay circuit
PM = Potential transformer, fuse, meter circuit
T = Tie switch
S = Station service
R = Rotary switch
SL = Street lighting
A = Oil circuit breaker, automatic
B = Transformer bank

Examples

Code number 402 designates an oil circuit breaker on a 13,200-volt circuit, line No. 4 at station No. 0 and located outdoors. As shown in the illustration, the breaker has two disconnects, No. 404 is located on the main bus side and No. 405 is on the line side of the breaker.

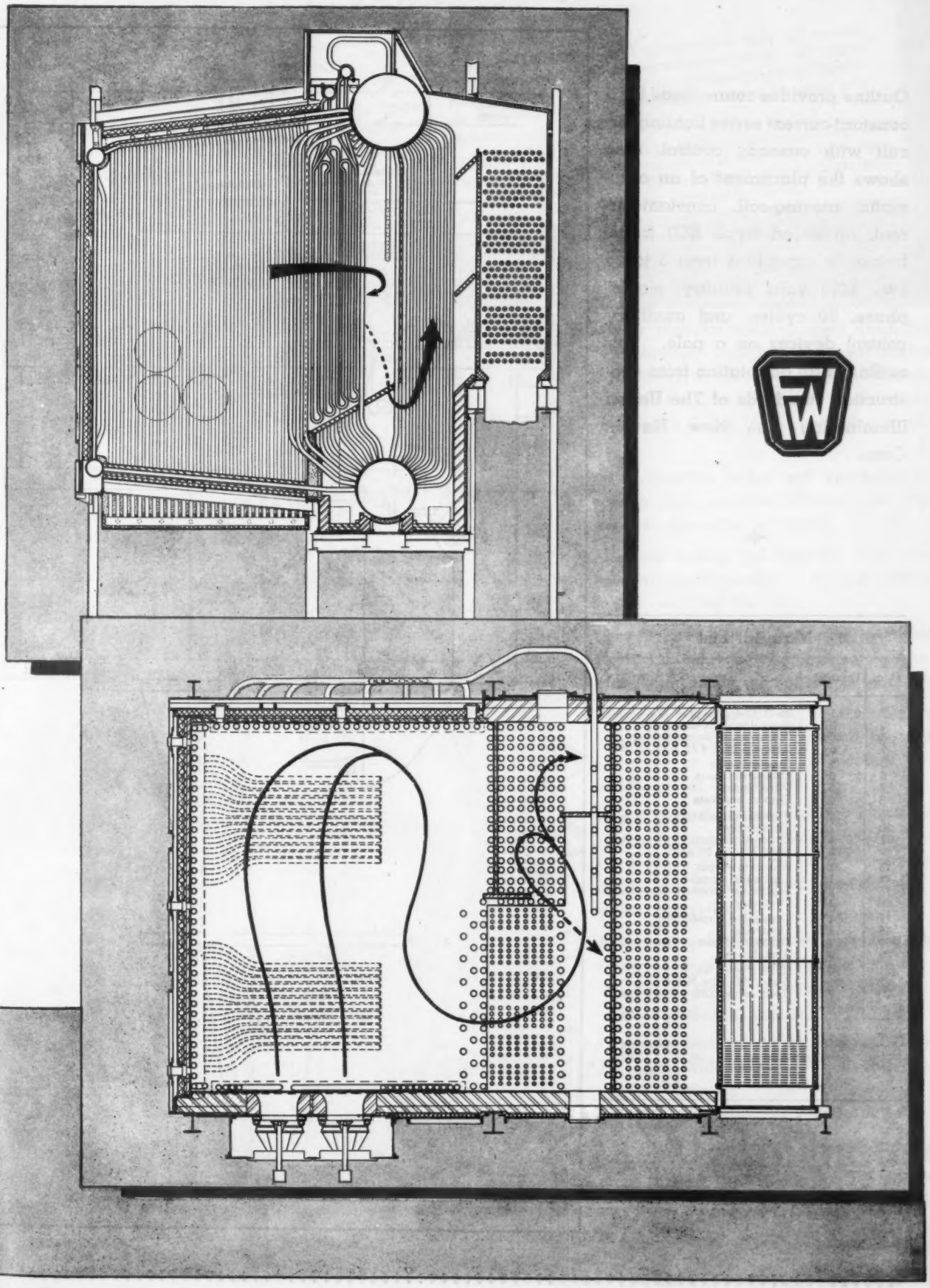
When the letter "B" precedes a switch number it indicates that the disconnecting device is connected to the high side of the transformer bank. Thus B162 designates an oil circuit breaker connected on high side of a transformer bank on line No. 1 at Station No. 6 and is located outdoors. When the number precedes the letter "B" it indicates that the disconnecting device is connected to the low side of the bank. Thus 1B61 indicates an oil circuit breaker connected on low side of a transformer bank on line No. 1 at station No. 6 and is located indoors.

Letter "A" for automatic oil circuit breaker is used as a sketch symbol only and is not made a part of the switch number.



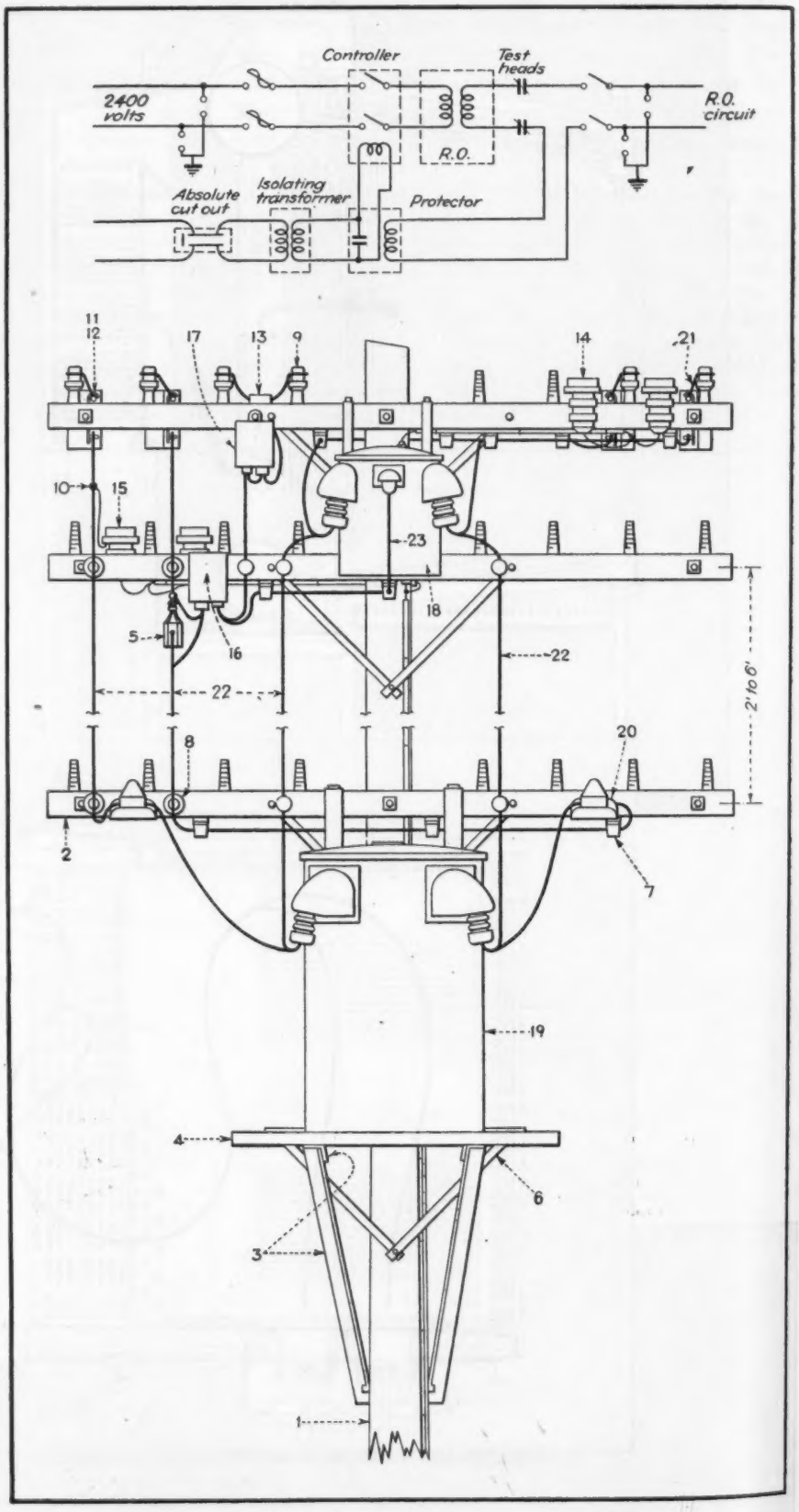
TYPICAL NUMBERING to identify switches and circuits

98% over Four Year Period



A GUIDE TO "RO" TRANSFORMER INSTALLATION

Outline provides connections for a constant-current series lighting circuit with cascade control, also shows the placement of an automatic, moving-coil, constant-current, oil-cooled (type RO) transformer in capacities from 5 to 25 kw., 2400 volts primary, single-phase, 60 cycles, and auxiliary control devices on a pole. This outline is an adaptation from construction standards of The United Illuminating Co., New Haven, Conn.



Material List

Item	Quantity	Description
1	1	35-ft. C-4 pine pole
2	3	8-pin double X-arm
3	26 ft.	2½ in. x 2½ in. angle iron
4	6	2 in. x 4 in. x 4 ft. 6 in. planks
5	1	Guy insulator
6	2	Crossarm braces
7	15	Wire holders
8	4	Duplex brackets
9	12	Porcelain insulators
10	21	Connectors
11	4	Cutouts, 50 amp.
12	2	Solid blades, 50 amp.
13	1	Absolute cutout
14	1	Lightning arrester
15	2	Lightning arresters (See Note)
16	1	Protector
17	1	Insulating transformer
18	1	Controller
19	1	RO transformer
20	2	Test heads
21	10 ft.	TBWP wire No. 6
22	50 ft.	5-kv., RC wire No. 6
23	7 ft.	Twin cable, 5000 volts, No. 10

Note:

Size RO Transformers	Size Arresters on RO Circuit
5–15 kw.	1–3 kv.
20–25 kw.	3–6 kv.

Type Ak-10 Universal Metal Hood Luminaire

FOR *Engineered* STREET LIGHTING

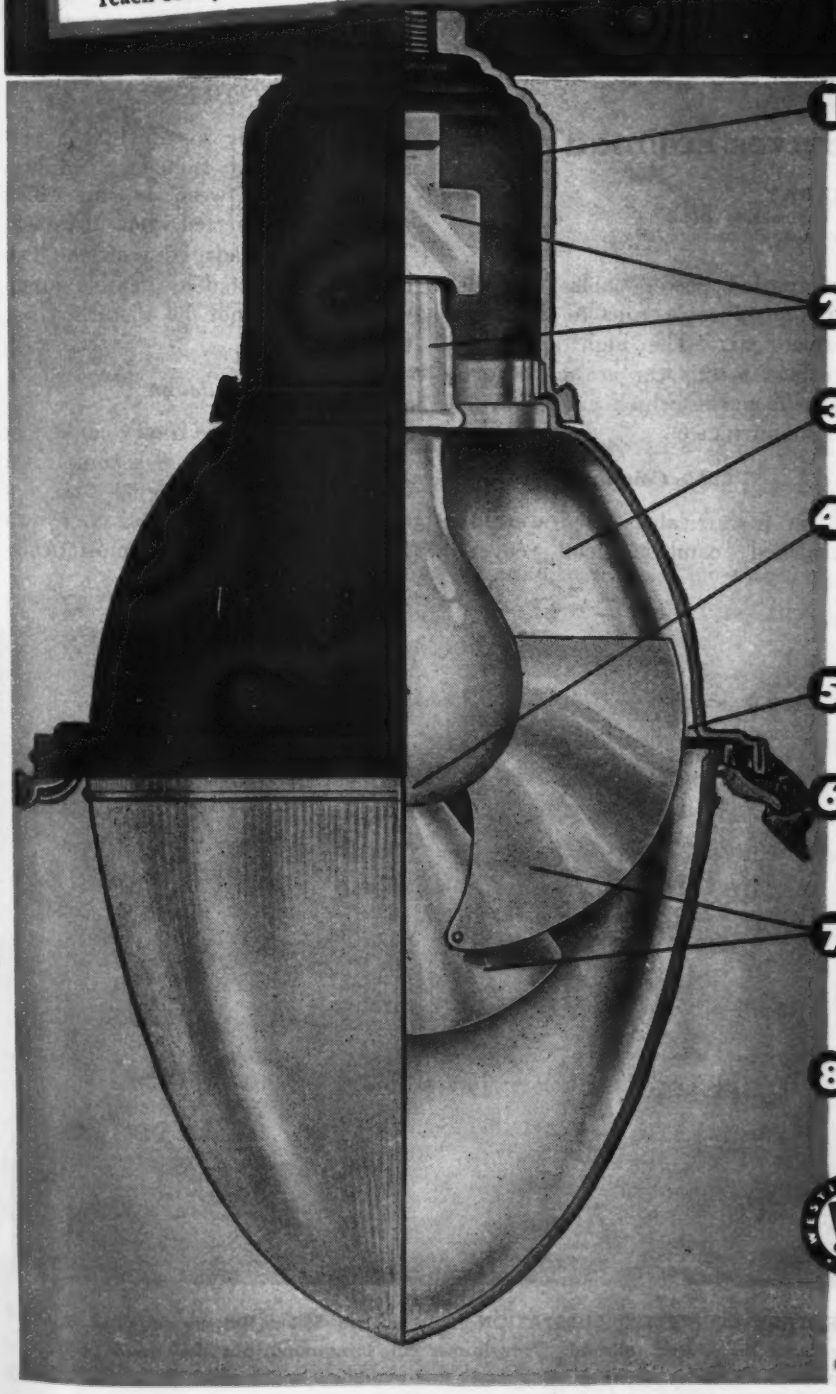
Here's what we mean by ENGINEERED Street Lighting.

FIRST: Product design that anticipates every known condition of street lighting operation and maintenance.

SECOND: Standardization of equipment—including hoods, housings, glassware, reflectors and adapters—that provides maximum flexibility and interchangeability, bringing modernized street lighting within the reach of any community by easy, economical stages.

THIRD: Interested and experienced help of trained Westinghouse Lighting Specialists—many of whom have participated in the design of the equipment itself—in the planning and application of street lighting programs.

FOR HELP in modernizing existing street lighting, or when planning a new program of public safety lighting, write to Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio.



1. **Low or High Voltage Aluminum Hood.** Die-cast aluminum, light in weight, yet exceedingly sturdy. Sheds water and has concealed breather vents for prevention of air vacuums in luminaire. Types for any mounting requirements.
2. **Heavy Porcelain Socket and Receptacle.** Provides highest insulation efficiency, permitting a dry flashover test of 19-KV.
3. **Aluminum Housing and Reflector.** Spun aluminum, Alzak processed for highest reflection factor and long life.
4. **Lamp Mounted Well Up in Housing to Minimize Glare.** Filament shielded, preventing excess glare in motorists' normal line of vision.
5. **Glassware "Cushioned" by Weatherproof Felt.** Breakage of glassware, caused by strain, vibration, or tension, is eliminated by a weatherproof felt gasket.
6. **Hinged Globe for Safety and Easy Maintenance** Globe holding-ring is held firmly in place by a hinge and toggle latch, leaving both hands free for quick and easy cleaning of globe and reflector.
7. **Alzak-Processed Biflectors for High Reflectivity.** Designed to control the lighting laterally on the street surface. Prevents "spilling" of light on lawns and buildings.
8. **Completely Standardized for Easy Maintenance.** All parts, including glassware and lamps, may be replaced "on location". 3-04 074

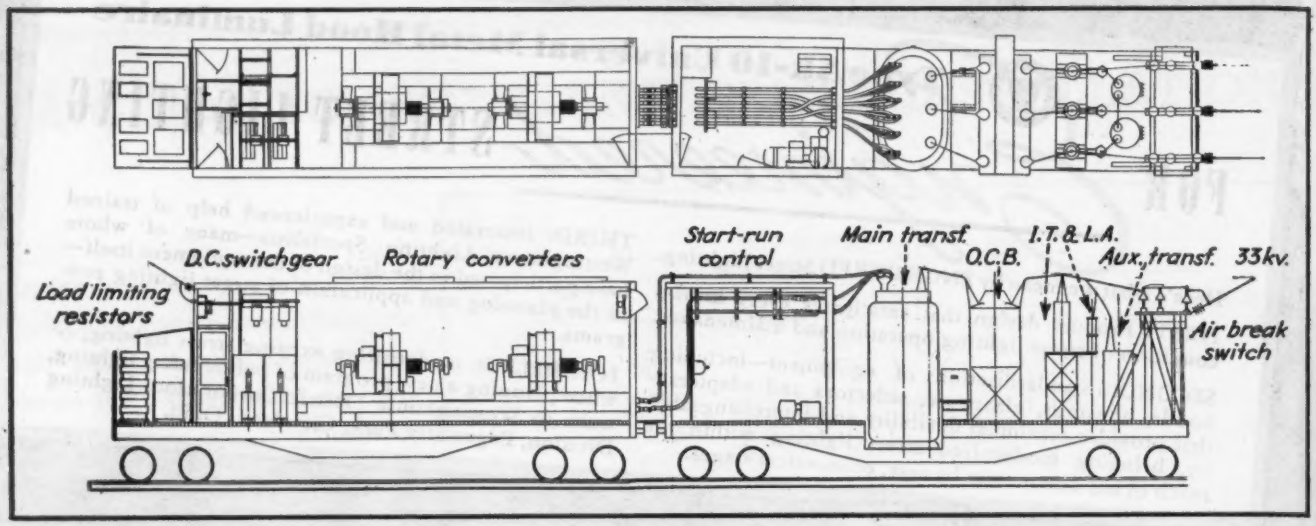
"GOOD STREET LIGHTING BUILDS GOOD WILL"

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

PUBLIC SAFETY

Lighting Headquarters



MOBILE CONVERTER SUBSTATION comprises two 750-volt, 1,000 amp. rotary machines in series, with necessary control equipment and switchgear. About one-third of transformer car enclosed to accommodate miscellaneous auxiliary equipment

Mobile Substation Serves Railroad

V. I. EASTERDAY
Station Engineer, General Engineering Dept.
Northern Indiana Public Service Co., Hammond, Ind.

Flexible reserve d.c. substation that can move up and down a railroad right-of-way was made available by a 1,500-kw. back-up substation, housed on two 50-ton railroad flatcars and built specifically to supplement normal supply on the 90-mile Chicago, South Shore and South Bend interurban electric line.

Electric service for the Indiana portion of this railroad is normally provided from eight rectifier and rotary converter 1,500-volt d.c. substations of Northern Indiana Public Service Co. fed from a 33-kv., three-phase, 60-cycle system.

Equipment for the desired mobile reserve was available in two 750-kw., 750-volt d.c. rotaries operating in series. The car carrying the 1,575-kva., 34,650- 555/555-volt, double-star-connected power transformer had to be depressed so the transformer would clear the overhead trolley, when in transit.

No Cable Pit

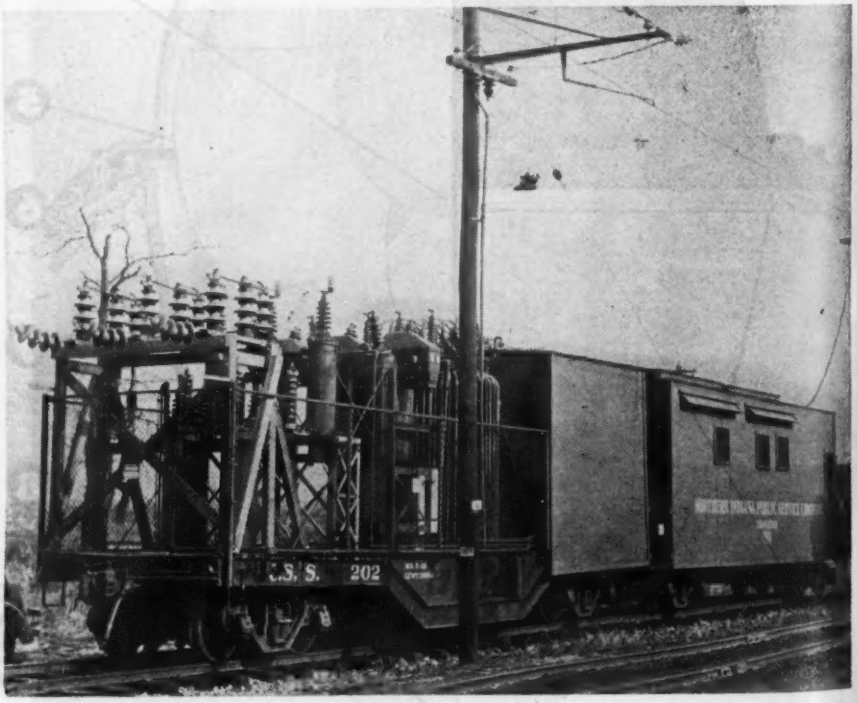
In lieu of a cable pit for connections on the under side of the converters, the machines were elevated about 20 in. on heavy fire-proofed wood timbers and securely bolted to the steel frame of the car in an interlocking scheme so that the machine frames are insulated from ground for flashover protective relaying. This elevation of the converters provided a raceway for the fire-proofed power cables and also for control cable runs to the transformer car. The high speed d.c. breakers in this car are enclosed by Transite panels which are removable for maintenance.

Cable Couplings

The power cables used were the varnished cambric lead covered cables originally installed at a permanent station. Bolted, taped lugs are provided between the cars which must be disconnected when in transit. The control leads between the two cars are connected by flexible jumpers and need not be disturbed for transit.

Ventilation

Ventilation of the rotary converters during cold weather is accomplished by natural drafts created by the machines. During warm weather, two 20-in., 1,725 rpm., thermostatically



ROTARY CONVERTER SUBSTATION built on two 50-ton flatcars provides mobile reserve for electric railroad. Transformer car, foreground, has depressed center to provide clearance between transformer and overhead trolley when in transit

IN 1934 GENERAL CABLE

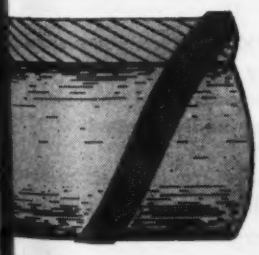
★ Now Available in Latest Improved Constructions and with Benefits of 11 Years' Operating Experience

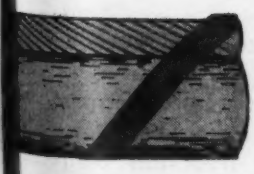
Installed in our Research Laboratory Proving Ground, the original 1934 product proved itself through nine years' rigorous trial at double working voltage. The first commercial installation was made in 1939. Since then, many miles have been successfully operated throughout the country.

That Aerial Power Cable affords economy in the long run and a most desirable factor of safety against service interruptions and public hazard, and is well recognized particularly where tree conditions prevail. *Up to 65%* labor savings in installations, plus greatly reduced tree-trimming and maintenance costs, have brought the modern General Cable SELF-SUPPORTING Type to the fore.

It eliminates unsightly open wire construction and enhances street appearance materially in both residential and business sections. No tree surgery to mar attractive surroundings.

It is especially adapted to post-war service extensions where underground duct cost is not justifiable. Numerous utility installations bear witness to its notable superiority in mechanical strength and reliability. Great trees which have fallen across these cables, have been cut down and removed, and the cables pulled back to normal sag, totally without interruption of service. Company engineers will be glad to supply complete technical data.





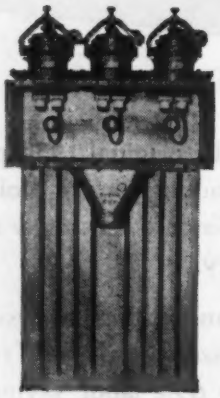
Non-leaded
Light in weight
Gencorone insulation

GENERAL CABLE CORPORATION

General Cable Corporation Sales Offices are located at Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Kansas City (Mo), Los Angeles, New York, Philadelphia, Pittsburgh, Rome (N.Y.), St. Louis, San Francisco, Seattle, Washington (D. C.)

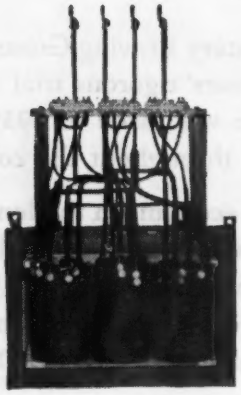
DAVIS TRANSFORMERS

A Davis Transformer for Every Purpose

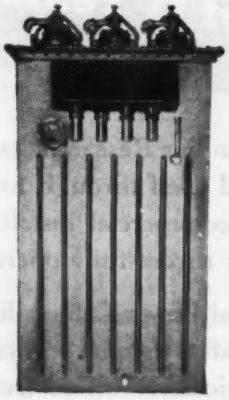


Primary side with gang operated oil fused cut-outs also cablehead for conduit lead covered cable.

Subway-Type



75 K.V.A., 60 Cycle, Three Phase, 4160—208Y/120.



Secondary side with four wiping sleeves for 500,000 CM lead covered cable and other NEMA and AIEE standard accessories.

Davis Transformer Company offers a complete line of power and distribution transformers both oil cooled and dry type. This has been our regular line for years consequently we are in production and ready to offer excellent service immediately without the usual reconversion problems.

DAVIS TRANSFORMER CO.
Phone 177 CONCORD, N. H.

and

STOCKWELL TRANSFORMER CORP.
CONCORD, N. H.—Phone 177 AKRON, OHIO—Phone Jefferson 4179

Manufacturers of Oil Cooled, Dry Type, Power and Distribution Transformers
Also All Types of Specialty Transformers Regardless of Size

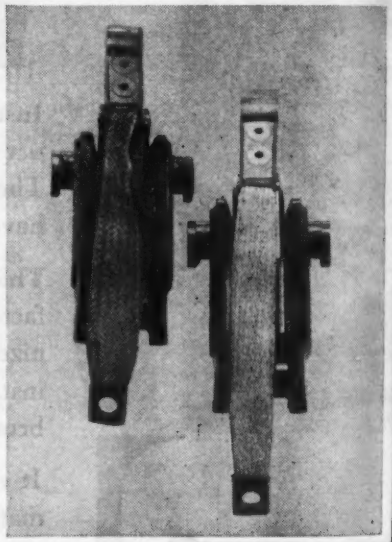
controlled electric fans mounted in the end of the car provide adequate forced-draft cooling. All openings are screened and louver-protected from weather.

•

Arc-Resistant Barriers

Ever since electrically driven machines were introduced to mining operations, there has been a problem involving proper insulation due to presence of dirt and moisture on insulating surfaces.

The Joy Manufacturing Co., manufacturers of mining machinery, felt dissatisfaction with insulating mediums then in use on electrical controllers. Excellent electrical properties, particularly arc resistance, were required and had to be combined with sufficient strength and impact resistance to withstand the excessive shock and vibration suffered by their equipment under service conditions.



METAL PORTIONS of control element were fused by a short-circuit between main line contactors but the plastic insulation was hardly affected

Experimental moldings were made from American Cyanamid Co.'s Melmac 3020, a rag-filled melamine-formaldehyde molding material. Parts manufactured from this compound were put under test and found to combine high impact strength with the arc resistance required, and consequently, it was decided to adopt this material on their electrical controllers wherever possible.

Control equipment is placed in explosion proof housings for protection against the ever-present coal dust and dampness in the mines. Arcing

WHEN THE INSULATION GOES—

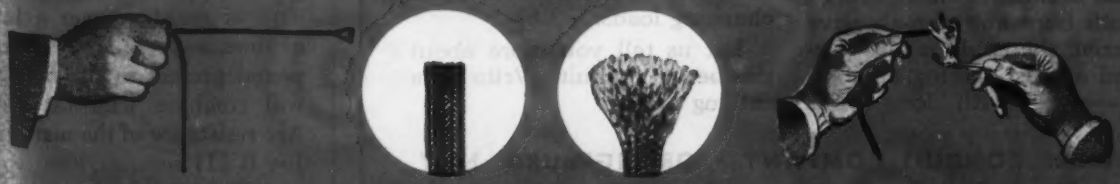
YOUR TROUBLE STARTS!

WHAT does it mean to *you* when Mrs. Smith's electric iron goes *phht?* If electrical insulation is a part of *your* product, whether it's appliance, radio or electrical equipment, you, like the iron manufacturer, run this *risk*. The risk of insulation failure—of inconveniencing customers, jeopardizing good will, and possibly losing sales.

Since your product's performance may depend on a few cents worth of insulation, be sure to use the best. Assure trouble-free service with BH Fiberglas Sleeving, the *original* non-fraying, non-stiffening, non-burning Fiberglas sleeving. An exclusive BH process combines *permanent* freedom from hardening, cracking or rotting with the many advantages of Fiberglas — including high dielectric and tensile strength, resistance to moisture, oil, grease and most chemicals.

Severest wartime uses prove beyond question the superior qualities of all three BH Fiberglas Sleevings in electrical applications for home and industry. One of them may fit your needs to a "T"—*plus!* Write for free BH samples today and put them to the toughest tests your product can dish out!

3 GREAT BH FIBERGLAS SLEEVINGS— *EACH 3 WAYS BETTER!*



NON-STIFFENING* **NON-FRAYING*** **NON-BURNING***

BH *EXTRA FLEXIBLE* FIBERGLAS SLEEVING • BH SPECIAL TREATED FIBERGLAS SLEEVING

BEN-HAR COATED FIBERGLAS SLEEVING

**Ask for sample folder giving degree above characteristics are combined in these three sleevings.*
All standard sizes and colors—available in standard 36-in. lengths and 500-ft. coils.

BH PRODUCTS

ALSO SLOW-BURNING IMPREGNATED MAGNETO TUBING • SLOW-BURNING FLEXIBLE VARNISHED TUBING • SATURATED SLEEVING • A. S. T. M. SPECIFICATIONS

BENTLEY, HARRIS MANUFACTURING CO.

Dept. W Conshohocken, Penna.

"Cable Corrosion? Never heard of it in ORANGEBURG."

Orangeburg, with its impermeable wall and tight taper sleeve joints assures dependable protection from corrosion by preventing infiltration of ground waters. Further protection is offered by the non-corrodible and non-corrosive nature of the conduit material itself . . . product characteristics which have helped to make Orangeburg so favorably known.

And because of Orangeburg's smooth bore and non-abrasive material, the cable is also protected against scoring or abrasion — even with long pulls around bends.

Furthermore, it's true that Orangeburg's lower coefficient of friction keeps pulling tension (and possible sheath strains) at a minimum.

Another important advantage of Orangeburg is protection with cable movement . . . The exceptionally smooth surface prevents wear in the cable sheath during alternate expansion and contraction with changing loads.

Let us tell you more about this better conduit. Write for a catalog today.

THE FIBRE CONDUIT COMPANY • ORANGEBURG, N. Y.
Graybar Electric Co. Inc. • *Distributors* • General Electric Supply Corp.

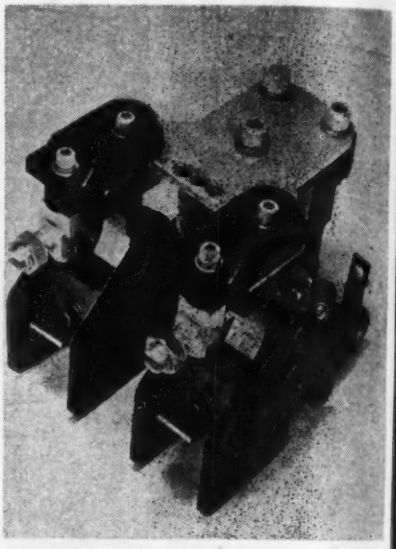
ORANGEBURG FIBRE CONDUIT

THE FIBRE CONDUIT CO. ORANGEBURG N.Y.

ORANGEBURG

WITH 50 YEARS EXPERIENCE IN THE MANUFACTURE OF NON-METALLIC CONDUIT AND PIPE, SERVES THE POWER AND LIGHT, TELEPHONE, GENERAL CONSTRUCTION, CHEMICAL, PETROLEUM, PLUMBING AND BUILDING SUPPLY FIELDS WITH ELECTRICAL FIBRE CONDUIT . . . ELECTRICAL UNDERFLOOR DUCT SYSTEMS . . . AND FIBRE PIPE FOR NON-PRESSURE USES.

caused by heavy duty, direct current service causes the oxygen in these sealed housings to combine with nitrogen, thus forming nitric oxides. Electrical equipment must be inspected and cleaned periodically, and when the housing is opened, the nitric oxide is absorbed by moisture, and nitric acid is created.



ARC BARRIERS as well as all other parts of mine controller made of arc-resisting rag-filled Melmac

Laboratory studies of rag-filled melamine moldings prove that such moldings will allow instantaneous arcing in the presence of nitric acid on their surface, but the heat of the arc thus created dries up the acid almost immediately with no carbonizing of the plastic surface. The acid itself has no effect, and after drying, normal arc resistance of the material is again obtained.

Studies show that rag-filled Melmac receives no deposit of a nitrate even when exposed to arcing in the presence of moisture over a long period of time, as there is no chemical compound present in the material which will combine with the nitric acid. Arc resistance of the material used by Joy is 111 seconds.

A classic example of the arc resistance offered by this molding material is a control part (see illustration) which broke down because of a short circuit between main line contactors. The metal portions of this unit fused upon contact with the great heat caused by this short, while the plastic insulation was scarcely affected.

Rag-filled Melmac is designed for industrial application where resistance to shock on the part of the finished product is desired. It com-

media through the scale to the metal surface where various types of corrosive action can be set up. Heavy scales are also brittle and consequently are liable to crack or flake off, exposing areas of the tube wall to the action of the circulating media. One of the most serious consequences of heavy scale formation on tubes, however, is directly associated with a resulting increase in tube wall temperature, due to interference of the scale with efficient heat transfer through the tube wall. It is generally recognized that corrosion is accelerated with increasing temperature and a moderate temperature rise of 10°C. may actually double the corrosion rate. Under any service, therefore, it is important to maintain as low a tube wall temperature as conditions will allow.

As an illustration of possible severe corrosion resulting from heavy scaling, a case may be cited in which a heat exchanger is operating with scale-forming cooling water passing through the tubes and hydrocarbon vapors containing active sulphur compounds circulating around the outside of the tubes. During the initial period of operation, the water side of the tube would be relatively free from scale and the tube wall temperature would approach that of the cooling water; as operation proceeded and an insulating scale built up on the inside tube surface, the tube wall temperature would then approach that of the hydrocarbon vapors and corrosion at the vapor side by the active sulphur compounds would be very considerably accelerated. Dezincification of Muntz Metal, uninhibited Admiralty Metal and occasionally even Red Brass tubes has often been experienced beneath heavy deposits of scale, due primarily to the relatively high tube wall temperature caused by the insulating layer of scale.

Various preventative measures may be taken to minimize tube failures directly attributable to scale formations on the tube surfaces. Chemical treatment of cooling waters has been successful in many installations for the purpose of holding in solution scale-forming salts which would normally precipitate out on the metal surfaces. Water treatment may also aid in minimizing corrosion of the tube metal. Neutralization of vapors, gases, etc. by specific reagents has also been used to reduce corrosion and prevent the growth of deposits on tubes. When such treatments can be economically employed, they should be given careful consideration. Under conditions which will not permit of scale preventative measures, it is good practice to clean the tube surfaces periodically either mechanically or chemically or by a combined mechanical-chemical treatment. Any mechanical cleaning of tube surfaces requires reasonable care as well as the use of proper cleaning devices so that no scratching, scoring or other damage to the tubes results. Chemical cleaning methods should be of such a nature that no active corrosion of the tubes or other parts of the unit takes place; on the other hand, the chemical treatment must be drastic enough to dissolve the deposit of scale completely or loosen it sufficiently so that it can be entirely removed subsequently by a mechanical treatment. It is obvious that a chemical treatment which will only attack and dissolve part of the scale without affecting other scaled areas may be detrimental instead of beneficial to tube life.

SCOVILL OFFERS 3 SERVICES

Information which operators of condensers and heat exchangers can use to improve results is one of three types of service available from Scovill. From this *Service in Manuals* (of which "Scovill Tube News" provides a sample), our customers are given the benefit of our engineers' most recent thinking and the results of their studies.

Assistance is the second Scovill service. Through *Service in Men,* our engineers are available to you for specialized, individual consultation on problems relating to installation and maintenance of tubes.

And the third Scovill service is *Service in Metals* which makes available to you our complete laboratory facilities to help you determine the alloy best suited to your conditions.

Write for a free copy of our Condenser Tube Booklet, addressing Scovill Manufacturing Company, 24 Mill Street, Waterbury 91, Conn.

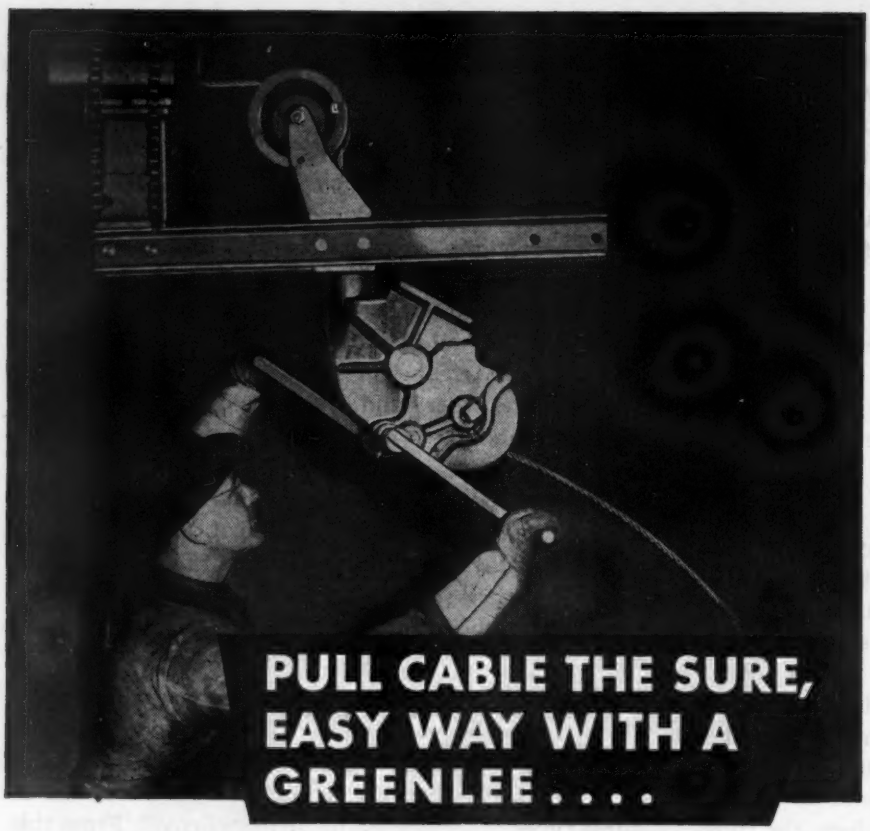
THIS IS NUMBER SIXTEEN in a Series of Scovill Advertisements to help you get longer life from condenser and heat exchanger tubes.

Scovill
MANUFACTURING COMPANY
WATERBURY 91, CONN.

SCOVILL CONDENSER TUBES

ONE PRODUCT... THREE SERVICES

Service in Manuals... Service in Metals... Service in Men



PULL CABLE THE SURE, EASY WAY WITH A GREENLEE . . . .

Simplify and speed cable installation work with a GREENLEE Cable Puller. Cut costs on each job with this fast-working, one-man-operated equipment.

And the GREENLEE does your work right! Clamps directly on to the conduit, *pulls straight out* to prevent loosening of hangers and damaging of cable insulation. Provides pull up to 7,500 lbs. Two speeds—one for fast pull, the second for steady, extra power for heavier work.

Easy to carry, easy to set up, the GREENLEE Cable Puller draws cable through all conduit: straight or bent, open or covered, on long or short runs. Attachments are available for pulling from concealed conduit also.

Save time, labor and trouble—install cable the easy way—with a GREENLEE Cable Puller. For complete details write today for your copy of free Catalog 33E. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1810 Columbia Avenue, Rockford, Illinois.

Get Ready with Greenlee!

REGISTERED TOOLS

GREENLEE

FOR THE CRAFTSMAN

HYDRAULIC BENDER—One man quickly makes smooth, precise bends in pipe up to 4½", rigid and *thin-wall* conduit, tubing, and bus-bars—with a GREENLEE Hydraulic Bender. Portable—easily carried to the job and set up—saves time and materials. Whatever your bending job, there's a GREENLEE to do it better, faster!

OTHER GREENLEE TIME-SAVING TOOLS FOR ELECTRICAL WORK

Hand Benders • Joist Borers • Electricians' Bits • Knockout Punches • Pipe Pushers

bines a relatively high Izod impact strength of 0.686 with the extremely high flexural strength of 14,000 pounds per sq. in. These properties materially reduce breakage due to shock and vibration, regardless of the application.

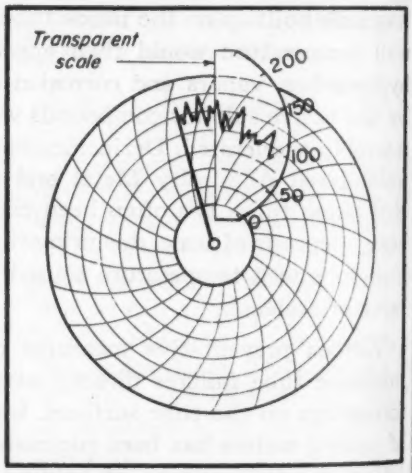
On Joy units operating on 90 volt d.c. service, all insulating parts are made from this new plastic material, even the arc barriers separating the various control units.

•

Engraved Figures on Guide Facilitate Chart Reading

In analyzing graphic demand charts for billing purposes and for load survey data, Philadelphia Electric Co. has used a transparent plastic guide to speed up operations. Figures were printed in ink on the guide corresponding with the chart divisions.

Since the figures were small and since they were printed on the guide



ENGRAVED FIGURES on transparent plastic guide facilitate analysis of demand curve on G.E. Chart No. 1141

with ink, legibility of the numerous scale divisions became more difficult as the ink faded and wore thin. John D. Sheetz of the engineering department suggested that the figures be engraved rather than inked on the guide surface.

Experience with this modification has proven that this not only increases the legibility but also increases the accuracy of the reading and decreases the eye strain.

Every assistance is given chart analyzers to reduce the strain and fatigue. Use of a "Magni-Ray" illuminated magnifier further facilitates checking the chart readings.

LOAD BUILDING

Commercial · Industrial · Residential · Rural

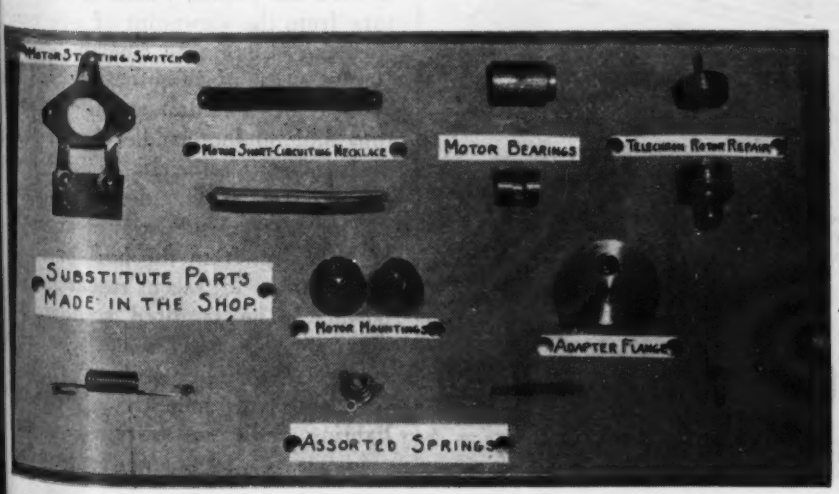
Wartime Servicing Brings Peacetime Benefits

T. M. FOULK,
Public Service Co. of Colorado, Denver

Troubles that beset the industry in securing appliance repair parts during the war are now somewhat alleviated. The manner in which utility and dealer repair shops met the challenge is a romantic chapter in itself, but the lasting benefits resulting from this war-time experience is of greatest interest now. Public Service Co. of Colorado, whose servicemen were as ingenious as any in making new parts where none were available finds that ingenuity and resourcefulness developed in repairmen as a result of this experience, have left the company with a far more proficient and skilled force to carry over into peactime servicing work. Not only have the workmen and the power company benefited, but the criticalness of the situation enabled the utility to render a public service by using its skilled mechanics in a training program that turned out servicemen for dealers and merchants throughout the territory served.

The impressive list of jobs performed included: Motor starting switches and bearings were made from materials at hand. Motor short-circuiting necklaces were made from scrap magnet wire by means of special jigs attached to the shop lathe. Rubber motor mountings were replaced with wooden mountings saturated with oil that gave excellent results. Telechron clock rotors were repaired by replacing worn bushings, cleaning the gears and adding a new supply of oil by means of a hypodermic needle inserted in a small hole drilled in the case. The hole was then sealed by a drop of solder. Evaporator adapter flanges were machined from brass salvaged from an old steam engine side-rod. Various kinds of springs were made from piano wire for many essential appliances such as home laundry equipment, refrigerator latches and electric water coolers. A milling machine attachment for the shop lathe has been invaluable for various machining operations. Some parts were made in quantities with resultant lower costs. Many of these parts have of course lately become available.

In most cases cost of making parts by hand was three to four times that of a similar manufactured article. The matter of costs was not the most important consideration, but rather it was to make quick repairs to customers' essential appliances.



DISPLAY BOARD shows handmade appliance repair parts turned out in utility shop

Members of the service department prepared an instruction course on bench work and the care and use of hand tools. New employees were given this training as an introduction to shop procedure, location of shop tools and as a means of employee orientation. The course was also given to other employees of the department as a refresher to bring them up-to-date on the proper use of tools. The misuse of hand tools has been corrected and tool breakage has been materially reduced, thus conserving scarce equipment that has been difficult to purchase. Results of the training have been excellent and the experience gained and methods developed during the war period will prove valuable post-war in quickly and properly training an enlarged service force.

Schoolroom Becomes Lighting Laboratory

WILLARD ALLPHIN
Application Laboratory
Sylvania Electric Products, Inc.
Salem, Mass.

Interest in the development of schoolhouse lighting at Salem, Mass., recently culminated in a highly satisfactory cooperative arrangement between the city authorities and Sylvania Electric Products, Inc., under which a working classroom at the Bowditch School is made available as a field laboratory for the installation and testing of lighting units and controls, with adjustable furnishings and window shades. Salem is Sylvania's home city, and for this reason was deemed to be a natural location for such development work. Tryouts of equipment and lighting layouts can be made here with maximum convenience both to the municipal authorities, the manufacturer and any other cooperating agencies. Perhaps best of all, the development work can be conducted in direct relation to active and classroom instruction, a free hand being allowed for experimental installations which can be maintained for as long or as short periods as good judgment indicates.

Originally this classroom, which is used by fifth grade pupils who remain in this place for the entire teaching period each day, was illuminated

THE NAZIS HAD A WORD FOR IT

Ersatz!

Not so long ago, lighting fixtures were made of various substitutes, held together with scarcely more than a prayer.

Some lighting products, we're told, are still made that way. But not SILV-A-KING products! Ever since Uncle Sam gave us the nod, nothing but the best of pre-war (and post-war!) materials and engineering have gone into SILV-A-KING fixtures. That's why today's SILV-A-KING fluorescent fixtures are drawn one-piece and seamless of heavy gauge steel, have a porcelain-enamel finish that will maintain initial reflectivity *and last for a lifetime*. That's why SILV-A-KING fixtures embody a host of important construction features that make for better performance ..... improved appearance.

SILV-A-KING "SPECIFICATION"
Lifetime porcelain fluorescent unit

Nothing "ersatz" about this bulletin! It's No. 45FS, fully describing the "Specification" model in both open and closed types.

SILV-A-KING LIGHTING EQUIPMENT

BRIGHT LIGHT REFLECTOR CO. INC.
Metropolitan & Morgan Aves., Bklyn. 6, N. Y.

by one 150-watt and eight 50-watt tungsten lamps in open glass fixtures. The room is 30 ft. long by 24 ft. wide by 12 ft. high, accommodating 32 pupils and a teacher.

Following the utilization of this room as a field laboratory, various changes were made to establish it as a model classroom. The teacher's desk was moved to a rear corner in accord with current advanced practice which considers the desk necessary for bookkeeping purposes only. The blackboards were replaced on two sides by "tack" boards, and at the front by a glass "chalk" board. The flooring was changed to a light gray asphalt tile with a marbleized pattern of black and red to camouflage dirt and heel marks. Portable desk and chair units of one piece each replaced the old style desks and chairs. The ceiling is of plaster, white, with a trace of wall color added. On the walls the painters used burnt sienna, burnt umber and French ochre, dragon red and a white base.

Arrangement of Luminaires

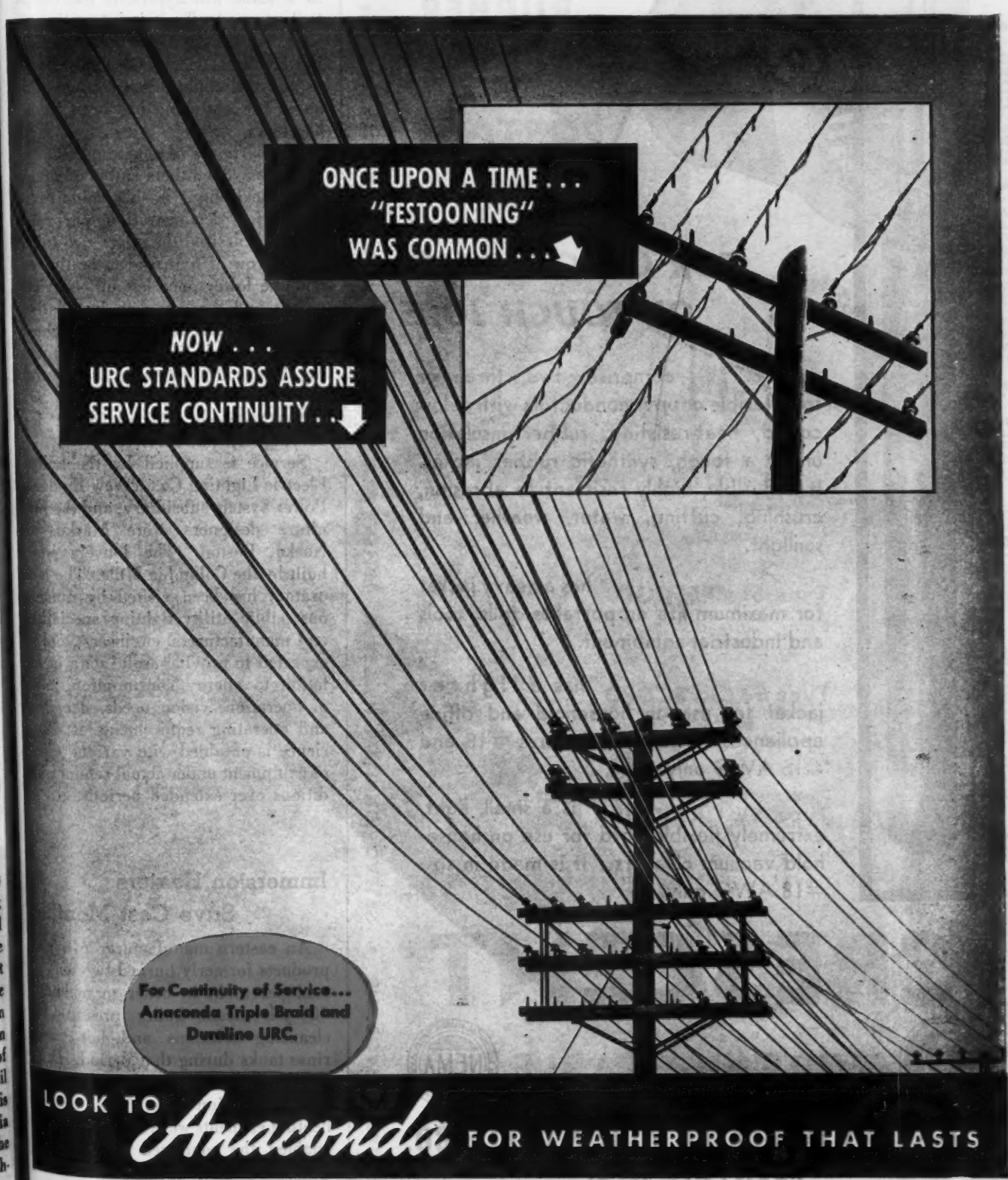
Present luminaires are V-shaped Sylvania units, each containing four 40-watt fluorescent tubes and rated with auxiliary equipment at 200 watts per unit. Nine such units were installed at a height of 10 ft. above the floor, and in three rows at right angles to the side walls and parallel to the end walls. The windows are in the west wall and these were equipped with louvers and shades to control the influx of daylight. This mounting of units at right angles to the windows gives a better working light in a downward direction and a good vertical illumination on the front of the chalk board, where no auxiliary lighting is therefore needed. The fixture units are provided with denser glass on the side toward the pupils, which is satisfactory from the viewpoint of eye comfort and still highly efficient.

Intensities of illumination are 40 foot-candles maintained on the desk tops and 30 foot-candles by vertical measurement on the chalk board. Blue chalk is used. The desk tops slant downward from the front at an angle of 18.5 deg. from the horizontal, in conformity with recent researches on posture. The required standard of illumination is maintained by a pupil who acts as "light monitor." On this pupil's desk is mounted a Sylvania lighting indicator working on the principle of a foot-candle meter with-

Thanks to URC development, Weatherproof lasts a lifetime . . .

ANACONDA

and lasting a lifetime means long, cost-reducing, maintenance-free service. No coming apart—no festooning. Anaconda also assures those background assets—careful research and testing—rigid engineering control. *Specify Anaconda URC Weatherproof.*


ONCE UPON A TIME . . .
"FESTOONING"
WAS COMMON . . .
NOW . . .
URC STANDARDS ASSURE
SERVICE CONTINUITY . .
For Continuity of Service...
Anaconda Triple Braid and
Duraline URC.
LOOK TO Anaconda FOR WEATHERPROOF THAT LASTS

RUBBER POWER CABLES • VARNISHED CAMBRIC CABLES • PERMACORD • LEAD-ENCASED AND PARKWAY CABLES • SYNTHOL WIRES • WELDING CABLES • SHIPBOARD CABLES • IMPERIAL NEOPRENE JACKETED PORTABLE CABLES • ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE CABLE • CRESCORD • BUILDING WIRE

CRESCORD

RUBBER JACKETED PORTABLE CORD

FOR LONG SERVICE ON TOUGH JOBS

CRESCORD comprises two, three or four flexible copper conductors with color-coded, heat-resisting, rubber insulation under a tough, synthetic rubber jacket. It is flexible, highly resistant to abrasion, crushing, cutting, water, weather and sunlight.

Type S CRESCORD has a heavy jacket for maximum life on portable drills, tools and industrial equipment.

Type SJ CRESCORD has a lighter jacket for use on household and office appliances. It is made in sizes #18 and #16 AWG only.

Type SV CRESCORD is a small, light, extremely flexible cord for use on household vacuum cleaners. It is made in size #18 AWG only.

CRESCENT

WIRE and CABLE

NEMA

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

out a graduated scale, and whose pointer indicates only whether the lighting intensity exceeds or falls below the prescribed 40-foot-candle limit. When the meter indicates substandard illumination, the pupil leaves the desk for a moment and switches on the lamps; the reverse procedure taking place when the intensity rises to a value which permits the lamps to be turned off. It is interesting to note that this scheme of light monitoring has been tried successfully down to and including the first grade. No automatic switching has been found necessary.

The wiring is of course adapted to laboratory conditions and is of maximum flexibility. Each luminaire is wired for demonstration purposes, so that if desired the upper two tubes in any row of fixtures can be lighted and the lower ones left off, or vice-versa; and the complete installation of all units can be run fully lighted when required. Six circuits terminating in a pull box serve the several units, and changes in the pull box contacts can be quickly made for varying tests and services.

Service is supplied by the Salem Electric Lighting Co., a New England Power System subsidiary, and the furniture designers were Markus & Nocka, Boston. The louvers were built by the Columbia Mills. The laboratory has been visited by numerous public utility lighting specialists and manufacturers' engineers, and is expected to provide useful data in relation to energy consumption, time of operation, vision needs, demands and operating requirements as experience is obtained with various types of equipment under actual school conditions over extended periods.

•

Immersion Heaters Save Cost Monthly

An eastern manufacturer of metal products formerly burned two tons of coal per night in order to maintain 50 psi. steam boiler pressure to cleansing solutions and hot water rinse tanks during that period. Coal cost $7 per ton, or $14 per night. Two immersion type, 5-kw. electric heating elements were installed, which enabled the coal-fired boiler to be banked daily at 5 p.m. and so held until 6 a.m. next day. The operating cost of electric heat was only $1 per

AB

"De-ion" Circuit Breakers

a complete line

for every application

★ *Quicklag* **1-POLE**

Ratings: 10-50 amperes. Thermal and magnetic trip. Safely interrupts 5,000 amperes, a-c on short circuit. Underwriters' approved for 125 volts, a-c.

★ *E-Frame* **1, 2, 3-POLE**

Ratings: 10-50 amperes. Thermal trip. Safely interrupts 5,000 amperes, a-c on short circuit. Underwriters' approved for 250 volts, a-c or 125/250 volts, d-c. Fifteen and 20-ampere single-pole ratings are Underwriters' approved for 277 volts, a-c.

★ *F-Frame* **2, 3-POLE**

Ratings: 15-100 amperes. For 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Thermal and magnetic trip. Universal mounting characteristics. Underwriters' approved. Safely interrupts 15,000 amperes.

★ *G-Frame* **2, 3-POLE**

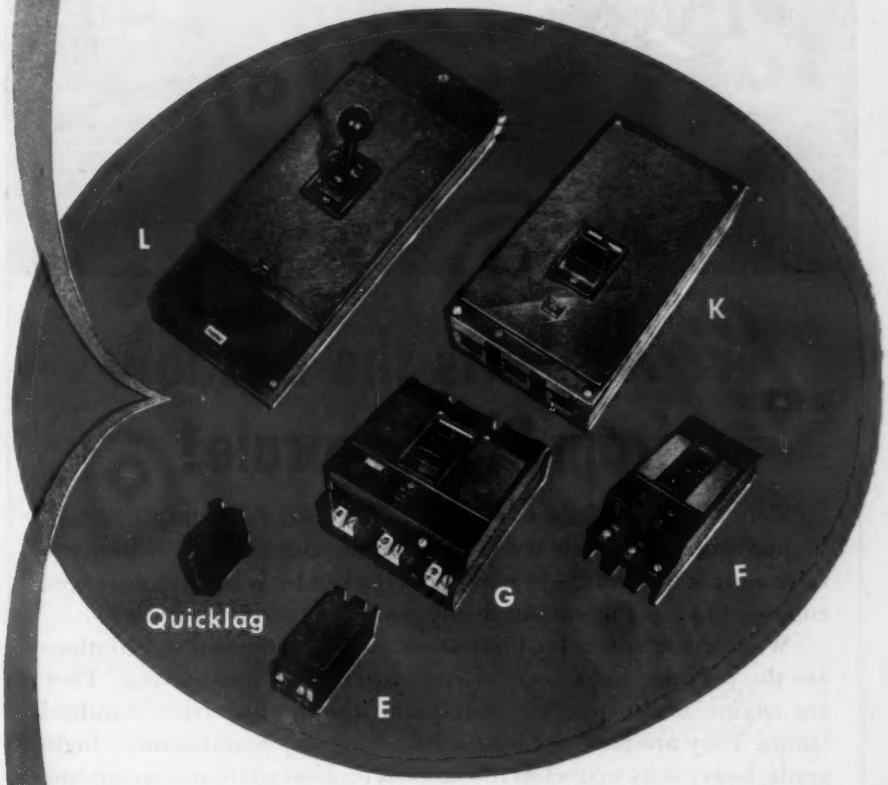
Companion to F Frame with thermal and *interchangeable* as well as *adjustable* magnetic trip. Ratings: 35-100 amperes. For 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Interrupting capacity 15,000 amperes, a-c. Underwriters' approved.

★ *K-Frame* **2, 3-POLE**

Thermal and magnetic trip with interchangeable trip. Ratings: 70-225 amperes. Underwriters' approved for 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Interrupts 15,000 amperes, a-c.

★ *L-Frame* **2, 3-POLE**

Ratings: 125-600 amperes. Underwriters' approved for 250 volts, a-c or 125/250 volts, d-c and 600 volts, a-c or 250 volts, d-c. Interrupts 25,000 amperes, a-c. Thermal and magnetic trip with interchangeable trip units.



Cut machine-hour losses with these Westinghouse AB "De-ion" Circuit Breakers. With them, power is not interrupted for harmless, momentary overloads. Service is restored swiftly and with ease when a circuit fault has been cleared. Every industrial requirement is met with these space-saving fuseless circuit breakers, available in capacities from 10-600 amperes.

AB Breakers are completely self-enclosed and sealed for safety. There are no parts to repair or replace. The "Quick-Make" and "Quick-Break" mechanism is a feature of every one.

Get complete information from your Westinghouse representative or write the nearest Westinghouse office.

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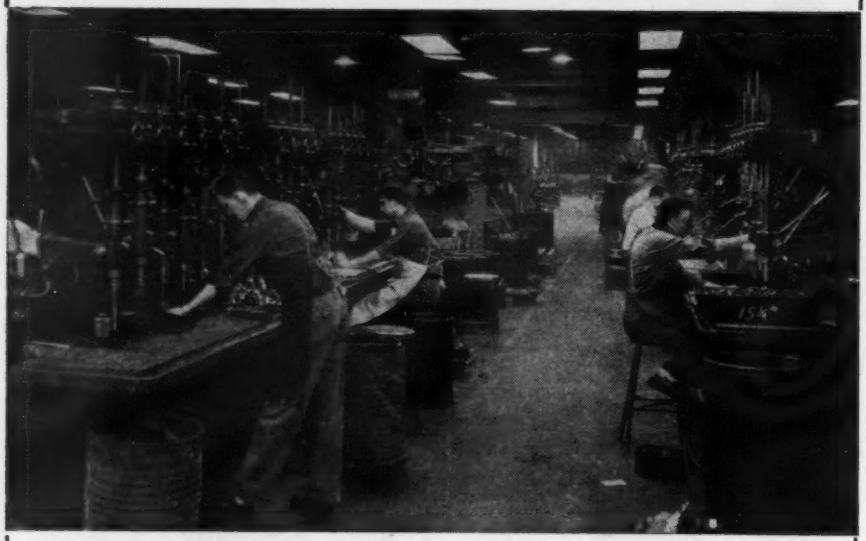
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

THE REFLECTOR IS THE BACKBONE OF ANY LIGHTING SYSTEM . . .

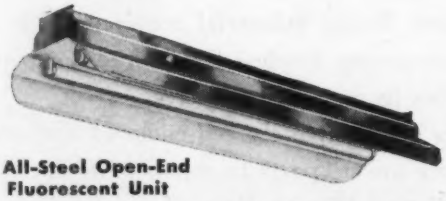


Light lifts the Shadow from Plant Morale!

Better lighting of the Wheeler type . . . *Skilled Lighting* . . . means higher morale through reduced eyestrain and fatigue. When you raise morale with Skilled Lighting . . . backed by Wheeler's advanced engineering . . . you automatically get better production too!

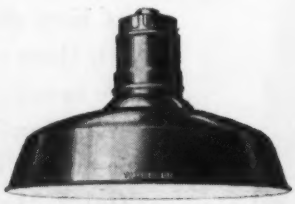
Wheeler reflectors for fluorescent and incandescent installations are the product of 64 years of specialized light engineering. They are *engineered* to produce maximum illumination from standard lamps. They are *built* for long service and easy maintenance: high-grade, heavy duty materials throughout . . . heavy vitreous enameling that really stands up and retains its high reflection factor.

Learn how you can brighten morale and boost production – get acquainted with Wheeler's complete line of Reflectors. Write for Catalogs. **Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.** Also New York. Representatives in principal cities.



All-Steel Open-End Fluorescent Unit

Available for two or three 40-watt, or two 100-watt lamps. Broad wiring channel with accessible, enclosed ballast. Can be mounted from chain or conduit, individually or in continuou runs.



RLM Solid Neck Incandescent Reflector

Maximum lighting efficiency for either indoor or outdoor use. Expertly designed, ruggedly built. 75 to 1500 watts.

Distributed Exclusively Through Electrical Wholesalers

Wheeler Skilled Lighting REFLECTORS

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night, making the gross saving $13 per night, or $315 per month during the six summer months. The investment cost of the immersion heater installation was but $200, so that if annual overhead charges were taken at 15 percent, or $30 the net saving was over $12.90 per night run (nightly overhead the year through was 8.2 cents). The installation thus paid for itself in less than a month, and this without counting the proportion of the fireman's wages allocated to the auxiliary boiler. After the electrical installation, which is a ring type heater, was made, the fireman utilized his time as night watchman.

•

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VERMONT FARMERS
and
COUNTRY DWELLERS

Our program for COMPLETE RURAL ELECTRIFICATION offers these advantages to country folks who want electricity:

1. EXCELLENT SERVICE—by an old experienced Vermont company—big enough to know its business and small enough to know its customers.
2. LOW RATES—
   (a) $2.00 minimum monthly bill—one third lower than the government financed systems in the state.
   (b) Prices for electricity that are as much as 30% less than those of government financed systems.
3. NO CONTRIBUTIONS FOR CONSTRUCTION AND NO MEMBERSHIP FEES.
4. AREA COVERAGE—everyone served who wants to be served in every area that we can reach. Your neighbors won't be "left out". There may be some few folks too far away for us or anyone else to reach with electric lines.
5. CONSTRUCTION FINANCED BY PRIVATE ENTERPRISE with investors' funds (much of it from Vermonters) —no increase in government debt from our construction.

ONE THOUSAND MILES

Our surveys indicate that we shall build about 1000 miles of new rural lines to do the complete job we have planned.

Men and materials are still at war in the Pacific. So we may not be able to bring electricity to all who want it as quickly as they and we want it done. We'll do it just as fast as we can and in as fair an order of priority as we know how.

If you have not yet signed an application for service and want it let us know.

CENTRAL VERMONT PUBLIC SERVICE CORPORATION

PRINCIPAL OFFICE—RUTLAND BRANCH OFFICES IN VERMONT

CENTRAL VERMONT Public Service, in planning to build about 1,000 miles of new rural lines as materials and labor become available, is emphasizing in current advertising the value of experience in serving this field, favorable rates and prices for energy under private enterprise, simple procedure and absence of farmer contributions to meet construction costs, and inclusive plans to serve everyone who wants to have electricity in every area the company or anyone else can reach. This program, the company points out, means no addition to government debt, and in the words of the management, is being planned by a company "big enough to know its business and small enough to know its customers"

Service Assures

Fluorescent Lighting

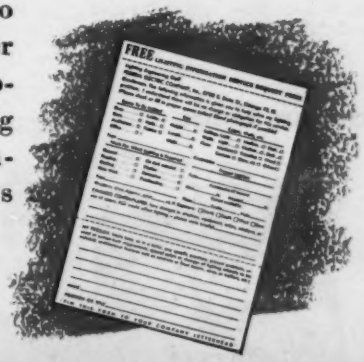
Popular demand for the many advantages of Zeon Cold Cathode Lighting has brought added responsibility to Federal Electric Company, Inc. With the rapid development of this modern illumination, it has become increasingly important, to the lighting industry as a whole, that fluorescent installations should provide the full benefits of glareless illumination, flexibility, and economy. To meet this responsibility, Federal Electric Company, Inc. is now offering Lighting Information Service.

Lighting Information Service

Lighting information service is designed to assist in planning installations so as to achieve the most effective results with fluorescent lighting. This Service offers the counsel of our lighting engineers. They will study your problem in detail. Based on 15 years' experience in the development of Cold Cathode Fluorescent Lighting, they will make recommendations that will assure your securing an installation properly designed to give you, to the fullest advantage, the flexibility, long life, and low maintenance cost possible with fluorescent lighting.

Make Use of Lighting Information Service

Submit your own problem in fullest detail, and let Federal Electric lighting engineers advise you. A photograph of space to be lighted will be helpful in clarifying your problem. Our engineers will recommend type, color, size, number of lamps; type, spacing, height of fixtures; loads, wiring, transformers required. Use their knowledge to perfect your layout. Lighting Information Service does not take the place of your architect, consulting engineer, or electrical contractor. It is designed to assist them—and you—to achieve the most effective results with fluorescent lighting. There is no obligation other than your cooperation in giving us full information to help us help you.



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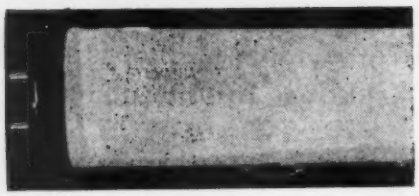
NEW EQUIPMENT

Fluorescent Lamp



T-12 fluorescent lamp: 40 watt. **Sylvania Electric Products Co., Salem, Mass.**

Fluorescent lamp is treated with an invisible hydrophobic coating which is reported to prevent the formation of a film of moisture. This is said to eliminate operating faults encountered in high humidity areas. The lamp is designed for use in a two-lamp compensated ballast circuit.

•

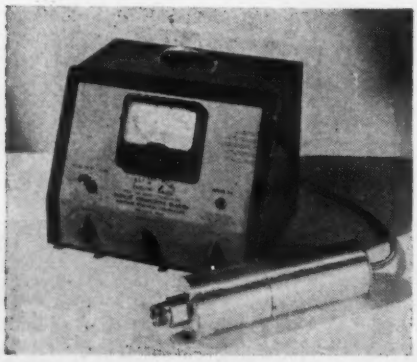
Reflectors

"Diamond facet" reflector: all sizes and types. **General Detroit Corp.**, 2270 E. Jefferson Ave., Detroit, Mich., and **General Pacific Corp.**, 1800 S. Hooper St., Los Los Angeles 21, Calif.

Reflector is said to eliminate the "dark spot" produced by smooth reflectors. It has a surface broken into small diamond shapes. It is made for use in floodlights, spotlights, lanterns, searchlights and flashlights of all sizes and types. Both companies are now producing a flashlight, called "Floodbeam", which utilizes the new reflector.

•

Vacuum Gage



Alphatron vacuum gage: scale up to 10 mm. mercury. **National Research Corp.**, Boston 15, Mass.

The unit is an all metal ionization gage with continuous linear response to 10 mm. in three ranges, all reading direct pressure. The ranges are 0 to 0.1 mm., 0 to 1 mm., and 0 to 10 mm. It may be used for measuring pressures of gases other than air, such as argon, water vapor and hydrogen. Characteristics of the radioactive element used and the design of the amplifier are said to insure stability and to reduce needle flicker.

•

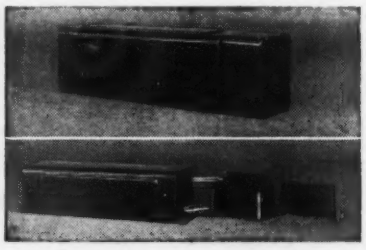
Welding Electrode

"Fleetweld 11-HT" welding electrode: available in 3/16 and ¼-in. diam. sizes; 18 in. long. **Lincoln Electric Co.**, Cleveland 1, Ohio.

Shielded arc electrode is designed for making groove butt joints and welding horizontal or flat fillets in the higher tensile steels. It is said to have a low spatter loss and welds are reported as produced with a steady arc and free from undercut. Welded test figures given are: tensile strength 75,000 to 80,000 p.s.i.; yield strength 59,000 to 62,000 p.s.i.; and ductility (elongation in 2 in.) 19 to 23 percent. Stress relieved at 1200 deg. F. figures are reported as 72,000 to 76,000 p.s.i.; 57,000 to 61,000 p.s.i.; and 25 to 30 percent respectively. Electrode may be used with either a.c. or d.c. and is said to conform to A.W.S. specifications E-7020 and/or E-7030.

•

Ballast

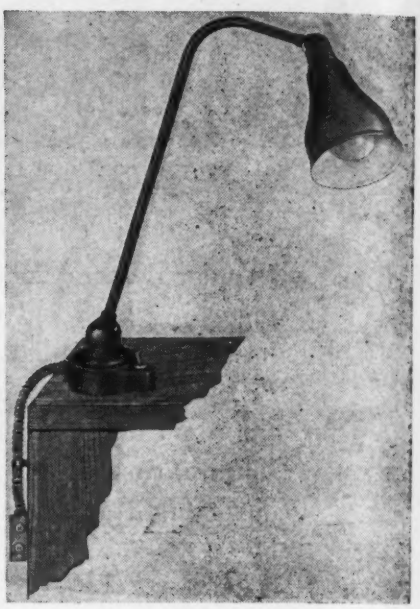


Cold cathode ballast with attachable union box. **Jefferson Electric Co.**, Bellwood, Ill.

Junction box is designed to fit the cold cathode ballast and is attached by the bolts used in mounting the ballast. The box is made in two pieces; one slides over the guides on one end of the ballast case while the other forms the cover which is secured by one screw. Suitable knockouts are provided in sides, ends and bottom. The device is on the approved list.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Lighting Equipment



Work-Lite: adjustable; accommodates up to 60-watt bulb. **Swivelier Co.**, 20 Irving Place, New York 3, N. Y.

Fixture is designed for use in work areas and may be permanently mounted on machines, benches, desks, etc. Unit comes with Greenfield cable and leads for direct attachment to outlet box or transformer. It is adjustable at both the arm base and the lamp head. The unit is available with arms from 12 to 30 in. in length, with cone, bell, parabola or acorn type of shade, and with or without removable frosted, clear or daylight glass lens.

•

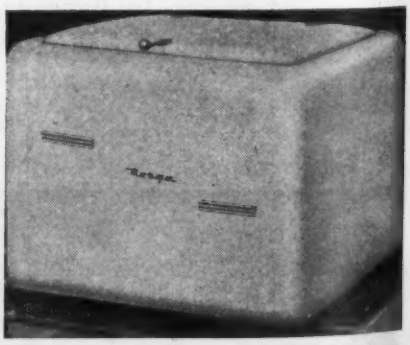
Starter

Type FS-20 "Watch Dog" starter for 15- and 20-watt fluorescent lamps. **General Electric Co.**, 1285 Boston Ave., Bridgeport 2, Conn.

Starters are stated to have all the features of the 30-, 40-, and 50-watt Watch Dogs and extends the line into the lower wattage lamp range. It is stated to have an average life of five years.

•

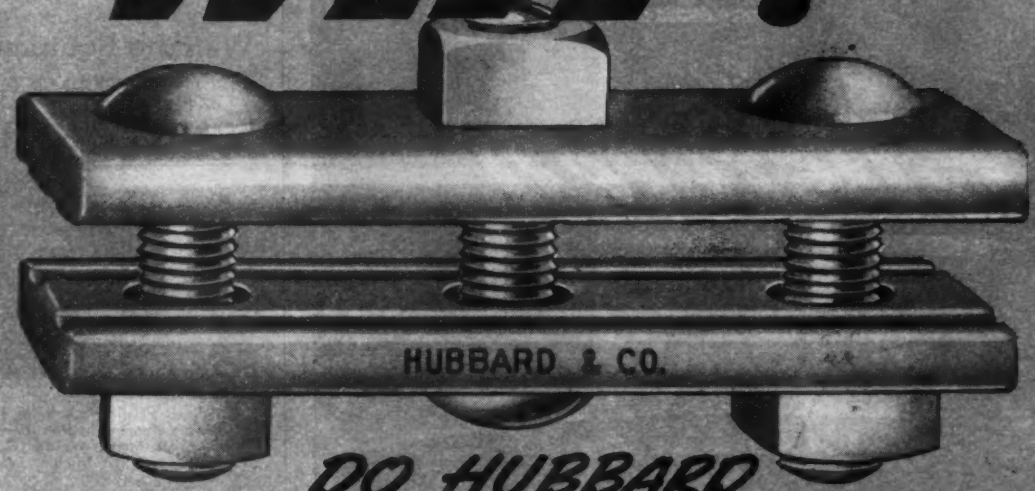
Home and Farm Freezers



Home and farm freezers: 6, 11, 18½ and 26 cu. ft. sizes; chest-type, lift lid construction; white exterior. Norge Division Borg-Warner Corp., 670 East Woodbridge St., Detroit 26, Mich.

The freezers are made in four sizes. The six cubic foot size is a single compartment model which is powered by a 1/6 hp. hermetic motor-compressor; the

WHY?



DO HUBBARD STRAIGHT GROOVE GUY CLAMPS HOLD BEST?

1. **Because:** The **straight** groove eliminates the possibility of drawing a nut tight against an "arched" section which is out of contact with the strand.

Clamping area reduced by warped section. Causes slippage at low strains.

Hubbard Clamps have full clamping area. Hold to breaking strength of most strands.

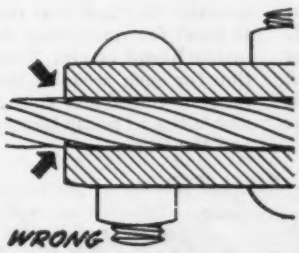
2. **Because:** The **straight** groove fits any and all twists, right or left hand and a variation in diameter without **creating** any high spots to **lessen clamping area.**

High spots in clamp reduce clamping area, cause slippage and injure strands.

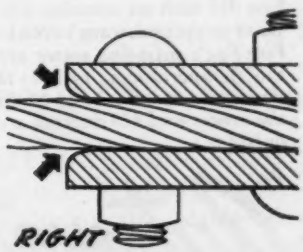
Hubbard Clamps fit snugly over any and all twists, right or left and variations of diameter.

3. **Because:** Bell-end grooves prevent injury to the strand.

4. **Because:** High carbon bolts prevent stripping or elongation. Heads are locked against turning while tightening—and the whole clamp is protected against corrosion by the best process commercially used — HUBBARD DOUBLE-DIP HOT GALVANIZING.



Sharp edge from sheared section injures and weakens the guy at end of clamp.



Rounded ends of Hubbard Clamp sections protect strand.

HUBBARD and COMPANY

Pittsburgh Oakland, Calif Chicago

This story will interest you!

A 93-foot open tank of crude oil was deliberately fired. The question to be answered was: Could Fire-Fog control and prevent the spread of fire over such a large area and still keep the tank from being destroyed?

It could and it did! By almost instant control of the burning area Fire-Fog did such an amazing job that the paint on the tank wasn't even blistered! *Fire-Fog's mist-fine water spray kept the temperatures inside the tank down to a maximum of 40 degrees in the center and 110 degrees around the outside.*

Then a second test was made—and a third—still no damage to the tank. Positive proof that Fire-Fog does protect vulnerable fire areas—definite support to the soundness of the principle of fire protection by controlled burning of flammable liquids.

Automatic in operation and supersensitive to quick heat rises, Fire-Fog is ideal for quenching fires of flammable liquid origin. Positive protection for such areas as loading racks, process buildings and areas, flammable liquid pump houses, valve pits and the like.

"Automatic" Sprinkler

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA

YOUNGSTOWN, OHIO . . . . . OFFICES IN 36 CITIES

"Automatic" Sprinkler manufactures and installs a complete line of fire protection devices and systems for all types of fire hazards. Listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories.

11-ft. cabinet has separate freezing and storage compartments, each with an individual lift-lid, and utilizes a ¼-hp. motor; the 18½-cu. ft. freezer has two storage compartments and a separate freezing space, each with individual lift-lids, and has a ⅓-hp. unit; the 26-ft. size is a three lid, three compartment model which provides 20½ cu. ft. for storage and 5½ cu. ft. for freezing and is powered by a ½-hp. unit.

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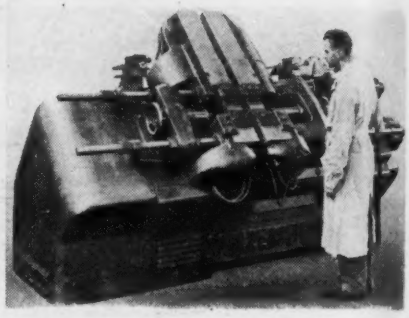
Welding Equipment



Butt-flash welding machine: 5 sizes from 20 to 250 kva.; electric, hydraulic, air or hand operation. **Progressive Welder Co.**, 3050 E. Outer Drive, Detroit 12, Mich.

Welders have large, T-slotted platens, either horizontally or angularly mounted, to accommodate a variety of interchangeable standardized or special purpose dies for handling various sizes and shapes of pieces which are to be flash welded. The five sizes in the capacity range are classified and rated according to recommended specification of the Resistance Welders Manufacturers Association.

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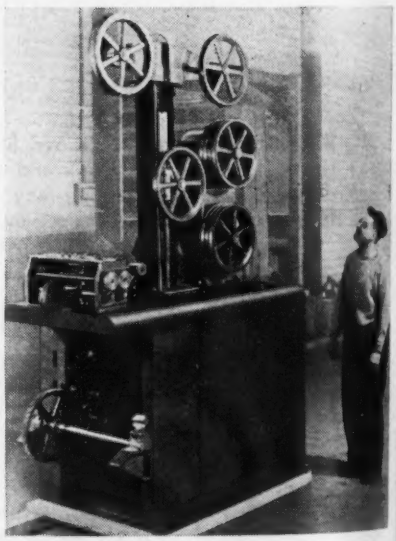
Wind-up Machine

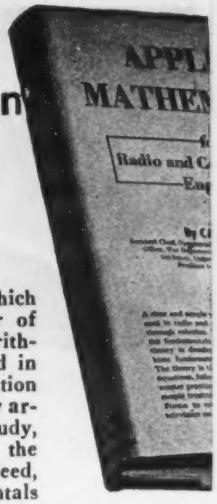


Wire and cable constant-speed, constant-tension wind-up machine; standard model accommodates 42-in. reel; for use with cable up to 1½ in. diam. **Industrial Oven Engineering Co.**, 11,621 Detroit Ave., Cleveland, Ohio.

Machine is a self-contained unit designed to maintain constant speed within variable production range. Standard speed ranges are 25 to 150, 40 to 200 and 60 to 250 ft. per min. The tension values range from 5 to 1,000 lb. The unit is motor driven and the horsepower required varies with the speed and tension required. A

Teach yourself MATHEMATICS

for big new jobs in *radio television radar*



Here's the manual which can make you master of mathematics, from arithmetic to calculus, used in radio and communication engineering. Especially arranged for home study, the book gives all the mathematics you need, from basic fundamentals to more detailed concepts—to help you get ahead in radio, television, frequency modulation, radar development.

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By CARL E. SMITH

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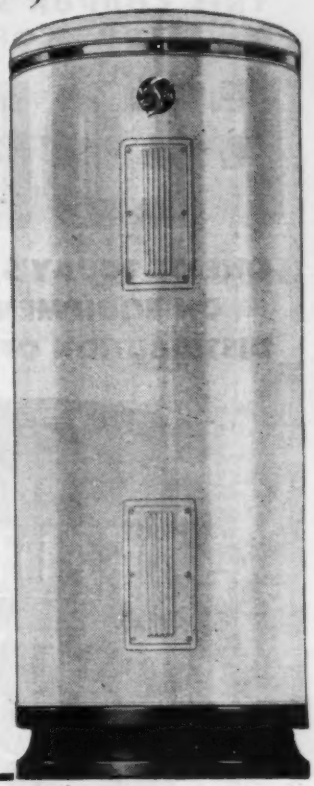

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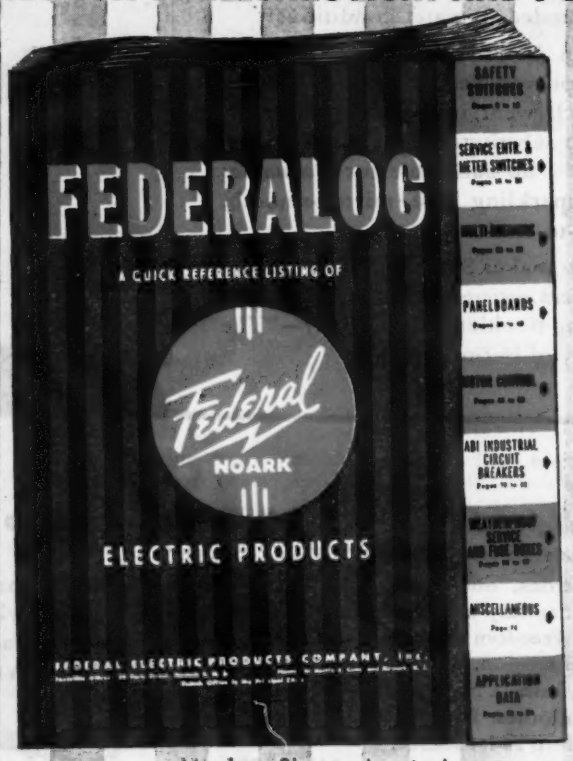

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special size which will accommodate a 60-in. reel is also available, as is a special model equipped with jack type casters for mobility.

•

Mousing Tool

Tool for dead-ending guy strand. **Copperweld Steel Co.**, Glassport, Pa.

The tool facilitates wrapping the annealed wire around the free-end of the strand and the main strand while dead-ending. It is reported that 50 wrapped turns with the tool will develop full rated strength of the strand. This type of dead-ending is applicable for attaching the strand to the various guy fittings, such as eye bolts, strain insulators and anchor eyes. The mousing tool differs from the company's serving tool in that it has two small J hooks which maintain the tension on the mousing wire and has design differences in the tines at both ends.

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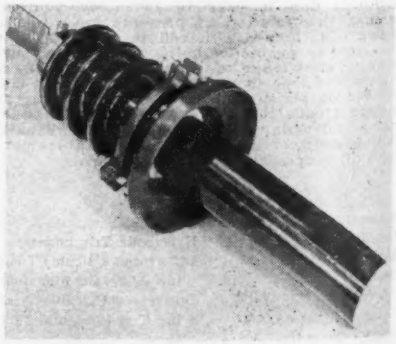
Transformer Bushings



Transformer bushing: ratings 7,500, 15,000 and 25,000 volts; 440 amps. **Pennsylvania Transformer Co.**, 808 Ridge Ave., Pittsburgh 12, Pa.

The cable from the transformer winding is brazed to a stud which issues through the insulator in a manner that is said to prevent it from turning when the hardware is attached. Electrical and mechanical connections between stud and hardware at the top of the porcelain are made by a cap nut tightened against the porcelain through a cork gasket, and a terminal cap on the same stud, tightened against the cap nut. Bushing is bolted to the mounting casing by means of a split flange which rests on top of the porcelain shoulder. A gasket is used between the shoulder and the transformer cover.

Now—a silicone varnish that cures at 300°F

DC 996 VARNISH

DOW CORNING
SILICONES

Dow Corning 996 is an electrical impregnating varnish for low temperature baking.

Dow Corning 996 was developed to provide manufacturers of new equipment and rewinders of old equipment with a heat resistant, waterproof silicone varnish which can be cured at temperatures obtainable in ovens now used for curing organic insulating varnishes.

Dow Corning 996 is used as the dipping or impregnating varnish for equipment wound with typical silicone insulation components. These include Fiberglas cloth, tape and sleeving varnished with DC 993; silicone bonded mica-Fiberglas for ground insulation; silicone bonded Fiberglas served magnet wire; silicone-Fiberglas laminated coil separators and slot sticks, and Silastic* coated lead wire.

Electrical equipment, wound with silicone insulating components and sealed by impregnating with DC 996, will have the high order of thermal stability and retention of waterproofness characteristic of silicone insulation.

Dow Corning 996 thus enables all types of electrical shops to realize the advantages of silicone insulation. It is recommended for use in equipment which is to be operated at temperatures up to 175°C. (347°F.). For higher operating temperatures, or extremely severe service conditions, DC 993 should be used throughout. The same methods of dipping, spraying, or vacuum-pressure impregnating that are used for applying conventional organic varnishes can be used with DC 996.

PROPERTIES—Dow Corning 996 is furnished as a 50 per cent by weight solution in an aromatic solvent and has a viscosity of 2 to 5 poises. In this consistency DC 996 is suitable for impregnating electrical equipment. It can be reduced to any desired viscosity with aromatic naphtha.

Dow Corning 996, when coated on metal, air dries to a slightly tacky, soft film. Baking the coated panel at 150°C. (302°F.) for a period of four hours will cure the coating to a non-flowing, tack-free, flexible film. DC 996 has ample heat stability for continuous use at temperatures as high as 175°C. or for intermittent use at higher temperatures.

ELECTRICAL PROPERTIES OF DC 996—(measured on coated panels at 25°C. and 50% relative humidity.)

Dielectric Strength, volts per mil	1500 to 2000
Dielectric Constant, at 1000 cycles	3.0
Power Factor, at 1000 cycles	0.7%

DOW CORNING CORPORATION
MIDLAND, MICHIGAN
NEW YORK OFFICE: EMPIRE STATE BUILDING

DISTRIBUTED BY

Electrical Specialty Co.	San Francisco
Prehler Electrical Insulation Company	Chicago
Insulation Manufacturers Corporation	Chicago
Insulation and Wires, Incorporated	St. Louis
Mica Insulator Company	Schenectady
National Electric Coil Company	Columbus
Westinghouse Electric Corporation Insulation Section, Micarta Division	Trafford, Penna.

* Trade name for Dow Corning Silicone Rubber

Dow Corning
FIRST IN SILICONES

"NO INSTRUCTIONS NEEDED WITH THIS EXTINGUISHER!"

Cumbersome, antiquated extinguishers can delay and panic employees—your *real* fire-fighters!

Randolph "4", lightweight and easy to use, is designed for the amateur. Just ONE HAND snaps this unit from its bracket . . . one trigger-touch sends an icy cloud of carbon dioxide deep into the blaze—smothers gasoline, oil, paint, machine and electrical fires in *split-seconds!*

A dry, non-toxic gas, carbon dioxide cannot damage equipment or conduct electricity. It leaves no stain or liquid—no shut-down from water damage.

See, by actual demonstration, how fast-action Randolph "2", "4", "15" or "25" can mobilize and simplify *your* fire defense. For fire protection guidance and prompt delivery of equipment, call your nearest supplier, or write—

RANDOLPH LABORATORIES, INC. 8 EAST KINZIE STREET CHICAGO 11, ILL., U. S. A.

TECHNICAL LITERATURE

Phasing—Bulletin No. 1910 describes a technique of phasing out circuits and of detecting the presence of voltage by the use of the Phasetector. Copies may be obtained from Railway & Industrial Engineering Co., Greensburg, Pa.

Flow Meters—"A New Era in Flow Rate Measurement" is a 32-page booklet describing the operation and application of rotameters. One of the subjects discussed is that of measuring flows with liquids of varying viscosities and specific gravities. Copies may be secured from Fischer & Porter Co., 912207-C County Line Road, Hatboro, Pa.

Standards—Three recently approved standards are now available from the American Standards Association, 70 E. 45th St., New York 17, N. Y. at a cost of 40 cents per copy. These are: 1. American Standard Definitions and General Standards for Wire and Cable (A.S.A. No. C8.1-1944) applies to conductors used in power applications. Standards were approved by ASA on December 12, 1944. 2. American Standard Insulator Tests is A.S.A. No. 29.1-1944 and is a revision of C29a-1930. They were approved by A.S.A. on Sept. 7, 1944 as a manual of test procedures to be followed in making tests to determine the characteristics of insulators to be used on electric power systems. 3. American Standards for Graphical Symbols for Power, Control and Measurement is No. Z32.3-1943 and is a revision of Z10g2-1944 and A.I.E.E. 17g2.

Reconversion—Three bulletins, each of which contains a check list, explains the "how" of taking equipment inventory and the parts which should be checked. The titles are How to take a Reconversion Inventory of (1) Centrifugal Pumps, (2) Electric Motors and (3) V-Belt Drives. Copies may be obtained from Allis-Chalmers, Milwaukee 1, Wis.

Relaying—A committee report that contains a series of paper and accompanying discussions which constitute a symposium on the principles of system relaying. One part deals with Metropolitan type systems and the other with transmission type systems. The papers cover several different systems and illustrate the application of relaying principles to a variety of conditions. Copies of publication No. M-3 is available from Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. for 60 cents to members, $1.50 to non-members, and $1.65 to foreign countries.

Hydraulics—A booklet entitled "Pointers on Installation and Maintenance of Barnes Hydraulics" contains curves of oil flow through tubes, safe working pressures of seamless tubes, table of internal working pressures for seamless steel tubing, and a nomographic chart indicating the flow capacity of pipes at recommended flow velocities. Copies of bulletin 013-G may be secured from John S. Barnes Corp., Rockford, Ill.

Pumps—Pump Engineering Data is the title of a 414-page handbook-catalog in which over one-fourth of the pages are devoted to the technology of pumping. Characteristics, hydraulic theory, testing, tabular and graphical data are items covered. Also included is handy design information about fluid flow and impounding, metals, pipings, energy and motor requirements, conversion factors, etc. Copies may be obtained from Economy Pumps, Inc., Hamilton, Ohio for $2.00 each.

Washing—Two booklets of interest to the power sales engineer. They are "Streamlined Washing Methods for Railroads" and "Bus and Car Washers." Each describes the mechanical equipment necessary for exterior washing of the rolling stock. Copies may be secured from Whiting Corp., Harvey, Ill.

THE TUBE THAT MADE

MECHANICAL-ELECTROSTATIC

DUST COLLECTION POSSIBLE

THE Duplex Dust Collector is like a double-barreled shotgun! "Why?"

Because it takes two barrels to get real results—the second barrel hits what the first one misses.

That, briefly, is the story of the new Thermix Duplex Collector. It combines *both* mechanical and electrostatic principles but its size is only slightly larger than the conventional mechanical units. And it *gets* results—94.66% *total* dust elimination, as proved by actual tests on extremely fine pulverized fuel dust! Dust escaping from this collector need never worry you even if dust ordinances and health requirements become increasingly severe. It solves your problem—economically—once and for all.

If desired, only the mechanical section of the Thermix-Duplex need be installed at the outset. Should greater efficiency be required, the secondary section can be added at any time. Furthermore, the Duplex is so designed that the mechanical unit *alone* will give high dust collection while the circuit of the electrostatic unit is being cleaned.

Write for bulletin giving engineering data.

•

THERMIX ENGINEERING COMPANY

Project and Sales Engineers

FIRST NATIONAL BANK BLDG., GREENWICH, CONN.

PRAT-DANIEL CORPORATION

EAST PORT CHESTER, CONN.

NEWS ABOUT PEOPLE

New Appointments Made by Georgia Power Co.

A new department, known as the industrial relations department, has been organized by the Georgia Power Co., Atlanta, with A. S. Goss, formerly superintendent of retail operations, as manager of the new department. The

A. S. Goss

safety department, under J. E. Stott, general supervisor of safety and training, will report to Mr. Goss, as will the insurance department, under the managership of D. C. Jones.

Following the transfer of C. B. McManus, formerly assistant operation manager to assistant to the president, and Mr. Goss to the managership of the new industrial relations department, J. M. Oliver, vice-president in charge of operations, announced changes in the operating department as follows: J. F. Pennington will be general superintendent of transmission and distribution. in charge of the work formerly supervised by him as superintendent of wholesale operations, in addition to the work formerly supervised by Mr. Goss as superintendent of retail operations. T. J. Allen will be superintendent of transmission, reporting to Mr. Pennington. Reporting to Mr. Allen will be E. H. Wildberger, supervisor of substations; A. C. Henderson, supervisor of transmission lines; W. P. Spier, acting supervisor of communications; and B. F. Colmer, supervisor of building maintenance.

Mr. Goss' service with the Georgia Power Co. and its predecessor companies dates from 1920. Prior to his position as superintendent retail operations, he was Augusta division superintendent.

Mr. Pennington joined the Georgia Railway & Power Co., predecessor of the present company, in 1918. He was assigned the duties of a helper in substation construction. Rising in the ranks he was appointed superintendent of the repair shop and finally supervisor of equipment and repairs before his recent promotion.

J. F. Pennington

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▶ Dr. Cornelius G. Brennecke, associate professor of electrical engineering at Lehigh University, Bethlehem, has been appointed head of the department of electrical engineering at North Carolina State College of Agriculture and Engineering Raleigh, N. C. Dr. Brennecke has served at Lehigh for the past three years as director of the university's work in electronics and communications. At State College he is succeeding Prof. William H. Browne, Jr., retired. Dr. Brennecke spent five years doing graduate research in atomic physics and conduction of electricity through dielectrics at New York University. Recently he has been carrying on research on electronic devices for decreasing mining hazards.

A. R. Kennedy, O. W. Jones Assigned New Duties

A. R. Kennedy has rejoined Central Power & Light Co. at Corpus Christi, Tex., as commercial manager, following a leave of absence during which he served as president of the Pecos Valley Power & Light Co. at Girvin and as

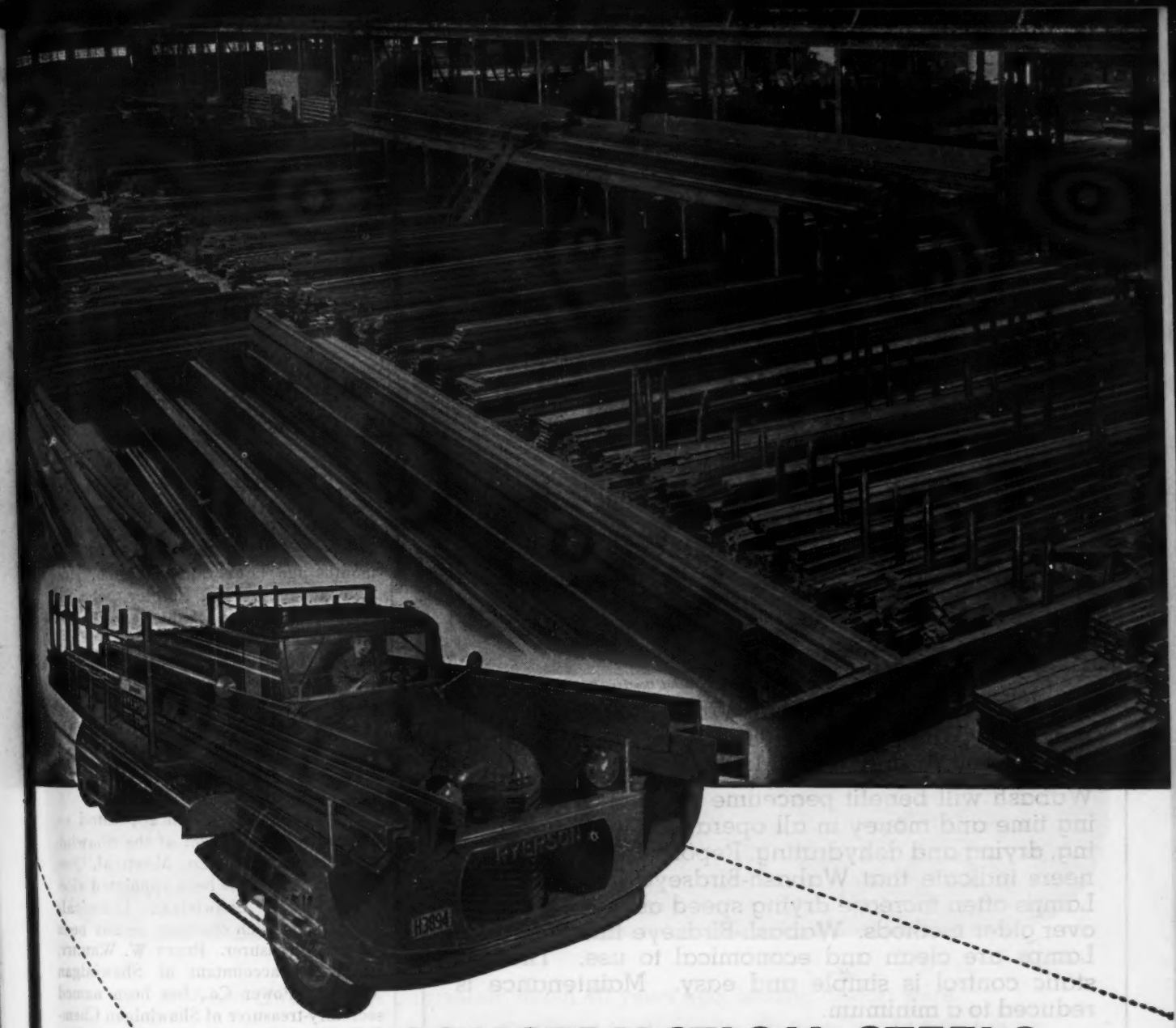
A. R. Kennedy

system dispatcher for the Central and South West Operating Committee with headquarters at Abilene, Tex. Mr. Kennedy began his career with Central Power & Light Co. in 1926. He has held various positions in the engineering and

O. W. Jones

meter departments, along with several managerial positions.

O. W. Jones has been appointed director of industrial development for the company. Associated with Central Power & Light Co. since 1926. Mr. Jones has served in the home office at Corpus Christi as power sales supervisor and commercial manager before assuming his present position. Before joining CPL, Mr. Jones spent ten years with the Texas Power & Light Co.,



CONSTRUCTION STEELS
every kind, quickly from stock

Contractors and construction companies can simplify steel procurement by concentrating many of their purchases at one convenient source—the nearby Ryerson Steel-Service plant. Building steels in a wide range of sizes are in stock. Facilities are ready to cut, punch or otherwise prepare the steel on schedule. And even in these times Ryerson deliveries are remarkably prompt.

Our engineers will be pleased to cooperate with you from first plans to finished job. Write for the Ryerson Stock List and send blue prints for quotation on all your steel requirements.

RYERSON PRODUCTS INCLUDE:

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Joseph T. Ryerson & Son, Inc., Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston

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DRYING TIME . . .
2 MINUTES!

Photo: Courtesy Fostoria Pressed Steel Co.

Think of it! In only 2 *minutes* Wabash-Birdseye Infra-red Heat Lamps bake the finish on these airplane parts in Bell Aircraft's Buffalo, N. Y., Plant!

Wabash will benefit peacetime production, too, saving time and money in all operations involving baking, drying and dehydrating. Reports from plant engineers indicate that Wabash-Birdseye Infra-red Heat Lamps often increase drying speed as much as 100% over older methods. Wabash-Birdseye Infra-red Heat Lamps are clean and economical to use. Thermostatic control is simple and easy. Maintenance is reduced to a minimum.

As you swing into competitive peacetime production, with its emphasis on speed and efficiency, it may well be worth your while to consider the economies possible with Wabash-Birdseye Infra-red Heat Lamps.

Wabash-Birdseye Infra-red Heat Lamps are standard for most Infra-Red tunnels, ovens, and other production line installations. In adapting your equipment to achieve the really dramatic results possible with Infra-Red, remember that Infra-Red heating is a science; *and, for maximum efficiency, Wabash-Birdseye Lamps should be used with scientifically engineered equipment.* We will gladly furnish names of manufacturers of such equipment.

WABASH APPLIANCE CORPORATION
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WABASH-BIRDSEYE
First in INFRA-RED

beginning in an engineering capacity at Dallas and later becoming commercial manager at Waco and manager at Cleburne. He joined the Columbus Railway, Power & Light Co. in 1908 and remained with that organization until he moved to Texas in 1916. Mr. Jones is well known in industry in the Southwest, being a director and past-president of the Petroleum Electric Power Club.

•

Elliott Company Elects W. A. Elliott President

At a recent meeting of the board of directors, W. A. Elliott was elected president of the Elliott Co., Jeannette, Pa. Mr. Elliott was elected executive vice-president of the company several months ago (ELECTRICAL WORLD, June 9, page 172). Mr. Shipley, who remains as chairman of the board, previously was also president.

F. H. Stohr, formerly assistant to the president, was elected executive vice-president and F. W. Dohring, who has been general sales manager, was elected vice-president in charge of sales.

•

▶ J. A. FULLER has been appointed assistant to the president of the Shawinigan Water & Power Co., Montreal, Que. Mr. Fuller has also been appointed vice-president of Shawinigan Chemicals Limited of which company he has been secretary-treasurer. PERCY W. WRIGHT, chief cost accountant of Shawinigan Water & Power Co., has been named secretary-treasurer of Shawinigan Chemicals Limited, succeeding Mr. Fuller. A. C. JONCAS succeeds Mr. Wright as chief cost accountant of Shawinigan Water & Power Co.

▶ CHARLES F. KELLS, formerly on the industrial engineering staff of West Penn Power Co., Pittsburgh, has taken over the management of the new post-war educational program of the Electric Industrial Truck Association. Mr. Kells will make his headquarters in Pittsburgh. After two years of service as an efficiency engineer in the water-works division of American Water Works & Electric Co. in New York, he became assistant to Walter S. Finlay, Jr., then vice-president and later president of West Penn Electric Co. After assisting in the consolidation of the transportation system, he spent several years as vice-president in charge of sales for Blue Ridge. When that system had become an autonomous operating unit of the West Penn system, Mr. Kells was transferred to the industrial power division of West Penn Power Co. Mr. Kells has been active in committee work

300 TIMES MORE LASTING

When Chromel was discovered, about 40 years ago, heating devices were of not much use, because of their short-lived heating units. Platinum would last, but it cost too much. We say that Chromel made the heating device business, because even 40 years ago, it had more than 300 times the durability of any other alloy used. And Chromel has grown more durable with every passing year.

For useful technical data ask for Catalog-M.

RESISTIVITY @ 68°F		WIRE (C. M. Ft.)	RIBBON (Sq. M. Ft.)
	Chromel-A	650 Ohms	510 Ohms
	Chromel-C	675 Ohms	530 Ohms
	Chromel-D	600 Ohms	471 Ohms
	Copel	294 Ohms	231 Ohms

CHROMEL

First in the Field of Nickel-Chromium Alloys

HOSKINS MANUFACTURING CO. DETROIT 8, MICHIGAN

PORTER
PORTABLE HAND POWERED CUTTERS

You can find PORTER CUTTERS in most, if not all, of America's great industrial plants.

They do production, maintenance and repair work, cutting rods, strips, chains, bolts, wire, wire rope, insulated cable and woven wire.

They press, crimp, punch, caulk, and split nuts; and they do all these things with amazing ease because only pounds pressure on the handles delivers tons power to the jaws.

Porter perfected this powering of cutting tools over 65 years ago. We have kept pace with the ever-increasing toughness and hardness of metals.

CUTS BOLTS and RODS

CUTS WIRE ROPE AND CABLE

CUTS CHAIN

CUTS REINFORCING RODS

Our catalog details capacities and explains power increase through leverage. May we send you a copy? Porter Cutters are sold through Mill Supply and Jobbing Houses everywhere.

H. K. PORTER, INC., 412 ASHLAND ST., EVERETT 49, MASS.

PORTER HKP CUTTERS

for the Edison Electric Institute and the Pennsylvania Electric Association. He served for more than two years with the War Production Board, returning to West Penn in 1944.

▶ GERALD W. WESTON has been appointed managing-director of the Southern California Radio and Electric Appliance Association with headquarters in Los Angeles. For the past two years, Mr. Weston has been with the War Production Board in Washington, D. C., in charge of the section handling the electrical appliance, radio, and machanical repair shops of the country. Prior to this connection he spent a year with the National Electric Contractors Association in Washington as assistant to the general manager; and nineteen years as manager of the Electric Association of Kansas City, Mo. Mr. Weston is a past-president of the International Association of Electrical Leagues.

▶ DR. IVAN A. GETTING has been appointed associate professor of electrical engineering at the Massachusetts Institute of Technology, Cambridge, following war-time service at the Institute as head of a division of the radiation laboratory concerned with research and development in the general field of radar application to gunnery.

▶ LOUI GARRETT, who served for 27 years as secretary of the Arkansas Power & Light Co. and predecessor companies, has resigned and has been elected secretary emeritus. LESLIE E. LEAS, who has been in Mr. Garrett's office for 23 years and for the last year has served as assistant secretary, has been named secretary.

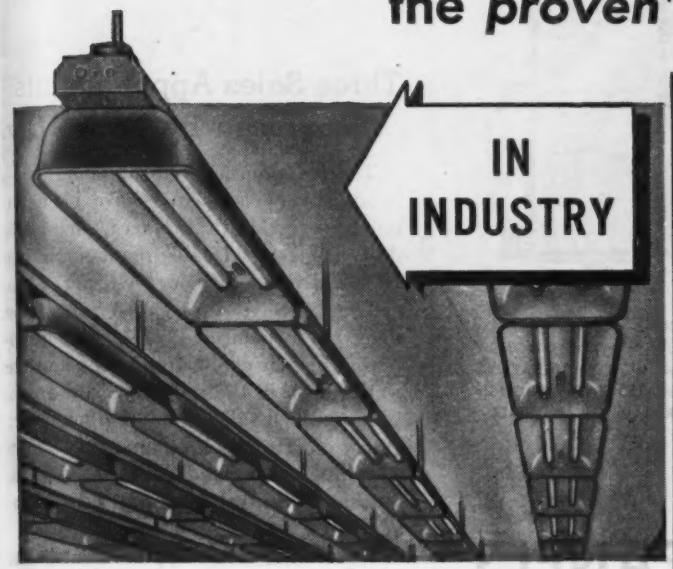
▶ THOMAS H. CARENS, vice-president of Boston Edison, has been made chairman of the metropolitan Boston district of the Committee on Economic Development. He is also vice-president of the Electric Institute of Boston, Inc.

▶ LESLIE H. MCKENNA, chief mechanical operator at Utah Power & Light Co.'s Jordan steam electric plant, Salt Lake City, has been promoted to plant superintendent, succeeding EDGAR F. BAILEY, resigned.

▶ G. PAUL EVANS, for the past ten years district manager of the San Juan Capistrano office of the San Diego Gas & Electric Co., has been appointed district manager of the company's Oceanside territory. Mr. Evans was at one time engaged in special construction and engineering activities for the utility. He succeeds A. R. WHISLER who retired September 1 after 22 years as manager of the Oceanside territory where large military camps and other war activities

Relight with Confidence

the *proven** Miller way



Miller *Continuous Wireway* FLUORESCENT LIGHTING SYSTEMS

offer 6 important advantages

1. Best *seeing* light at lower cost
2. Modern appearance
3. 30 to 50% lower cost of installation
4. Reductions up to 80% in wiring material
5. Simplified maintenance
6. Special construction features

* The Miller Company has pioneered better lighting for 101 years.

Miller *Continuous Wireway* FLUORESCENT *TROFFER* LIGHTING SYSTEMS

offer the "basic 6" plus:

7. *New* Architectural aids
8. *New* possibilities in esthetic design
9. *New* architectural and structural versatility
10. *New* installation simplicity

Miller *50 and 100 foot candler* fluorescent lighting systems are known the world over. They were an important factor in winning our war of production.

Miller Fluorescent Troffer Lighting Systems (for stores, offices, schools and public buildings) have *already* opened new vistas in architectural design. They have *already* solved old structural problems—without creating *new* problems.

The Miller way to better lighting is the *known* way—the *proven* way—the way of no regrets.

Miller field engineers are conveniently located to serve you.

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SINCE 1844

ILLUMINATING DIVISION
Fluorescent, Incandescent
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OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

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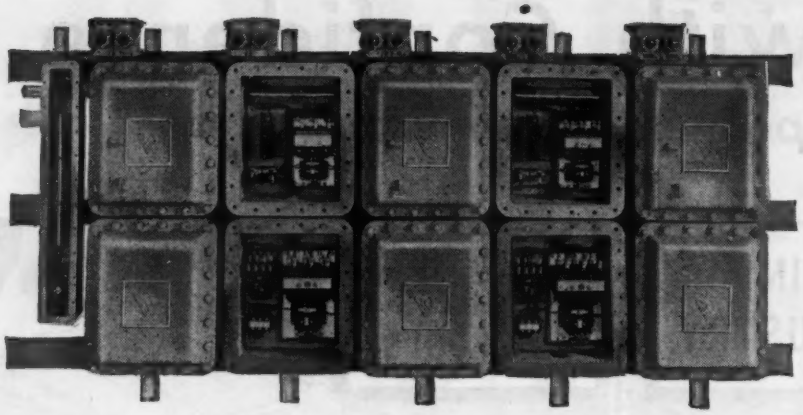


EXPLOSION PROOF CONTROL PANEL FOR FIVE GROUPS OF ELECTRICAL STRIP HEATERS INSTALLED ON ETHYLENE GAS PIPE LINES & DRUMS. THE PANEL MADE UP OF FIVE SECTIONS & EACH SECTION CONTROLS SEPARATELY ONE GROUP OF HEATERS. A MOTOR OPERATED SEQUENCE SWITCH & TEMPERATURE INSTRUMENTS (NOT SHOWN) OPERATES THE VARIOUS CONTACTORS & RELAYS SO THAT THE HEATERS ARE CONNECTED IN PARALLEL OR IN SERIES DEPENDING ON THE TEMPERATURE REQUIREMENTS.

R&S CUSTOM BUILT PANELS

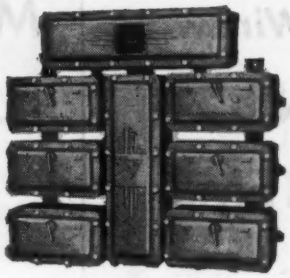
FOR ALL HAZARDOUS AREAS

Over the years R&S has pioneered in the development and standardization of precision-built control equipment in keeping with industries' expanding requirements of new processes and codes.

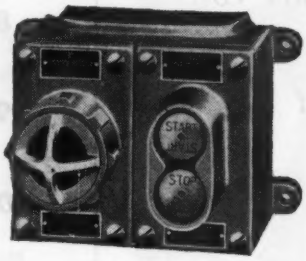
A large variety of standardized explosion-proof enclosures is available for grouping and assembly of control and power units in panel form, at minimum cost and without the usual delay of special designs.

R&S Standard Enclosures have wall sections permitting a great variety of conduit arrangements and sizes to suit job requirements. This simplifies material lists and reduces inventories caused by field changes.

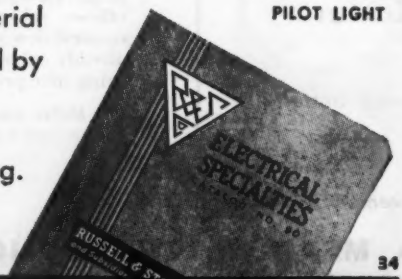
Ask for the 300-page R&S Catalog.



CIRCUIT BREAKER PANEL FOR LIGHT OR POWER



PUSH BUTTON STATION WITH PILOT LIGHT



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RUSSELL & STOLL COMPANY

EXPLOSION-PROOF, WATER-TIGHT, INDUSTRIAL LIGHTING FIXTURES AND EQUIPMENT. AUTOMATIC LOCKING "EVER-LOK" CONNECTORS

125 BARCLAY STREET · NEW YORK 7, N. Y.

recently were located. Succeeding Mr. Evans at San Juan Capistrano is LLOYD M. WALL of the company's engineering department.

•

Three Sales Appointments Announced by Norge Div.

Three appointments to the company's headquarters sales staff have been announced by M. G. O'Harra, vice-president and general sales manager of the Norge division of Borg-Warner Corp.

They involve three men who have long been identified with the distribution of household appliances and are well known in the industry: Howard L. Clary, named sales promotion manager; Harry J. Holbrook, manager of electric range sales and John P. Morgan, southwest central regional sales manager.

With their new appointments, Mr. Clary and Mr. Holbrook return to private business after three years with the War Production Board in Washington. Mr. Morgan relinquished his war-time duties last November. Mr. Clary was connected with the Ludwig Hommel Co., Norge's oldest distributor, before he joined WPB. Mr. Holbrook was connected with a Norge affiliate before joining WPB and Mr. Morgan was formerly in the Norge purchasing department.

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► LOUIS F. EATON has been appointed manager of the Woonsocket (R. I.) division of the Blackstone Valley Gas & Electric Co., succeeding HARRY L. PEARSON, who has joined the staff of the Stone & Webster Service Corp. in New York. Mr. Eaton has been connected with Stone & Webster organizations for many years, having been with the Brockton (Mass.) Edison Co., the Boston staff of the Service company, the Blackstone Valley company at Pawtucket, and lately assistant general manager of the Montauk Electric Co., Fall River, Mass. He is a graduate of Amherst College and later attended the Massachusetts Institute of Technology for two years' electrical engineering work. Mr. Pearson was formerly general superintendent of the Central Illinois Electric & Gas Co., Rockford, and went to Woonsocket in 1942.

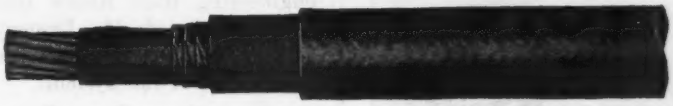
► RUSSELL J. GINGLES has been appointed manager of the farm electrification bureau of the National Electrical Manufacturers Association. Mr. Gingles formerly edited the Illinois REA News. After graduating from Marquette University, where he studied journalism, he engaged in sales promotion and pub-

Continuous operation, copper-heating overloads, high ambient temperatures, oil, grease and corrosive fumes have been rough on emergency power, control and lighting wiring that wasn't built to stand up long under such conditions . . . so don't trust to luck and be sorry later.

Check up right now on war-worn circuits that run too close to steam lines, furnaces, forging presses, annealers, kilns, soaking pits . . . or anywhere that heat and other severe conditions may cause trouble . . . and rewire with Rockbestos A.V.C. *permanently insulated* wires and cables. They save money by practically eliminating maintenance because they are built to take 230° F. without baking brittle, cracking, flowing or de-centering . . . and won't rot or bloom from contact with oil, grease or corrosive fumes.

For detailed information on Rockbestos-designed National Electrical Code types in our line of 125 different standard constructions, write to the nearest branch office or:

ROCKBESTOS PRODUCTS CORPORATION, 106 NICOLL ST., NEW HAVEN 4, CONN.



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ROCKBESTOS A.V.C. 600 VOLT POWER CABLE (National Electrical Code, Type AVA)

The cable above and similarly insulated Motor Lead Cable have a maximum operating temperature rating of 110° C. (230° F.) and this permanently insulated construction:

1. The conductor is perfectly and permanently centered in helically applied insulation.
2. Felted asbestos insulation, impregnated with heat, flame and moisture resisting compounds, withstands conductor-heating overloads and won't dry out, bake brittle, flow or burn.
3. Lubricated varnished cambric for high dielectric strength and added moisture resistance, protected from heat and flame by two felted asbestos walls.
4. Outer felted asbestos wall, impregnated with heat, flame, and moisture resistant compounds, serves as an effective barrier against high ambient temperatures and flame.
5. A tough rugged asbestos braid, resistant to heat, flame, moisture, oil, grease and corrosive fumes.

125 different wires, cables and cords developed for severe operating conditions by Rockbestos.

INVEST IN U. S. VICTORY BONDS

ROCKBESTOS A.V.C.

The Wire with Permanent Insulation

NEW YORK BUFFALO CLEVELAND CHICAGO PITTSBURGH ST. LOUIS
LOS ANGELES SAN FRANCISCO SEATTLE PORTLAND, ORE.

ROCKBESTOS A.V.C. 600 VOLT BOILER ROOM WIRE
(Nat. Elec. Code Type AVA—max. operating temp. 110°C.)

Sizes No. 18 to 8 AWG insulated with varnished cambric, impregnated felted asbestos and asbestos braid. Sizes 6 to 4/0 have another wall of impregnated asbestos next to the conductor.

For lighting and control circuits exposed to heat and moisture, oil, grease, corrosive fumes or fire hazard, such as exist around furnaces, ovens, lehrs, soaking pits, boilers, etc., this widely used A.V.C. construction is ideal. Its permanent insulation will not bake brittle, crack, rot, flow or swell.

ROCKBESTOS A.V.C. 600 VOLT CONTROL CABLE

In one to 19 conductors with individuals insulated like Power Cable, cotton braid covered, and cabled with an asbestos braid overall. Standard strandings AWG No. 12—19/#25 and No. 9—19/#22. Other strandings on order.

Designed for use in equipment requiring a multi-conductor control cable capable of withstanding high temperatures, this cable is widely used in the control systems of electric cranes and other equipment used in steel mills. The insulation is unaffected by heat, corrosive fumes, oil or grease and has ample moisture resistance.

★ ★ ★ ★ ★

ANOTHER NEW ROCKBESTOS FIREWALL CONSTRUCTION!

War-developed Rockbestos High-Temperature Wire — *with a maximum operating temperature of 400° F.* — designed for jet propelled plane applications and circuits to hot-wing de-icers, fire detectors and extinguishers, and air conditioning and heating units where baking temperatures destroy ordinary insulation. Under continuous operation at rated temperature it retains its original dielectric strength and inherent resistance to heat and flame, and *progressively improves* in its resistance to moisture and abrasion. It is now available for these and other severe applications. Write for complete information and samples.

GEORGE E. RUPPERT
PRESIDENT
J. RUPPERT SCHALK
VICE PRESIDENT

JACOB RUPPERT
BREWERY
1639 THIRD AVENUE, NEW YORK 28
TELEPHONE ATWATER 9-1000
N Y S L A LIC NO D-1

N. GARRISON GILLECK, 3rd
SECRETARY
FREDERICK M. LINDER
TREASURER

Buell Engineering Co., Inc.
70 Pine Street
New York, N. Y.

April 9, 1945

Gentlemen:

Seven years ago we built our power plant. When we were considering the installation of a system to collect fly ash, our engineering department recommended Buell equipment.

We are now pleased to say that the Buell Fly Ash Collectors have efficiently done the job for which they were installed. Moreover, during the six and a half years in constant operation, it has not been necessary to expend one cent for mechanical maintenance or repairs.

In view of this performance, it is my pleasure to tell you that we consider Buell Fly Ash Collectors a highly satisfactory plant investment.

Very truly yours,
JACOB RUPPERT

GER: H

George E. Ruppert
President

• BUELL DUST RECOVERY SYSTEMS are used throughout industry in the collection or reclamation of many kinds of dust, in numerous production and process operations.
Hundreds of satisfied industrial users will attest to Buell's—
"High Efficiency, Low Maintenance, Long Life."

buell
DUST RECOVERY SYSTEMS

BUELL ENGINEERING COMPANY, INC.
10 Cedar Street, New York 5, N. Y.
Sales Representatives in Principal Cities

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

licity work in New York and Boston and subsequently obtained practical experience as a reporter on country newspapers. From 1931 to 1942 he was on the staff of the Moline Illinois Daily Dispatch and in 1942 became an independent publisher, operating a small weekly newspaper. He then devoted his attention to the Illinois REA News.

•

▶ ARTHUR R. TOFTE has been named manager of the advertising and public relations department, Allis-Chalmers Manufacturing Co., Milwaukee. Mr. Tofte has been a member of the department since 1938. He succeeds GEORGE J. CALLOS, who resigned to become vice-president and account executive for Klau-Van Pieterson-Dunlap Associates, Inc., Milwaukee advertising agency. Mr. Tofte entered the advertising field in 1925 after graduating from the University of Wisconsin.

▶ DONALD S. BENNETT has been appointed power sales supervisor for the New England Power System utilities of the Northeastern, Mystic Valley and North Shore districts, with headquarters at Malden, Mass. He was formerly with the Philadelphia Electric Co., and later joined the Worcester County Electric Co., in Massachusetts, where he served for 16 years in various departments, including five years in the power sales department. In 1940 he was named power sales engineer for the Northeastern district, with offices at Lowell, Mass. FRANK E. CAULFIELD, for the past six years power sales engineer with the Lowell Electric Light Corp., and 16 years on that company's staff following graduation in electrical engineering from Rhode Island State College, succeeds Mr. Bennett as head of district power sales in the northeastern district of the System.

▶ R. I. WOOLLEY, manager of Utah Power & Light Co.'s branch at Evanston, Wyo., has been named head of the company's division at Rexburg, Idaho. He succeeds J. E. CUSHMAN, transferred from Rexburg to Preston, Idaho, as manager.

▶ FRED KNAUS has retired as industrial sales engineer for Seattle City Light after 25 years of continuous service. Mr. Knaus started with Seattle City Light in 1910, and during his period of service gained recognition for his work in the field of rate structures.

▶ DAN M. GALVIN has resigned as southwestern district manager for the Westinghouse Lamp Division. After being associated with Westinghouse for fifteen years, Mr. Galvin has resigned to form his own sales organization, rep-

MORE VARIACS* NOW!

A portion of our greatly expanded VARIAC production has been released from war orders. VARIAC deliveries are improving daily. We hope that within a comparatively short time all models of the VARIAC can be shipped promptly upon receipt of your order.

In the meantime you'll find several weeks required for delivery of some models well worth the waiting . . . VARIACS are still the original continuously-adjustable autotransformer first introduced by General Radio . . . redesigned to meet all of the mechanical and electrical requirements for all types of service . . . assuring rugged construction, long life and the same manufacturing care that is given to the finest G-R laboratory instrument.

You may have to wait a little longer for VARIACS, but you'll be satisfied many times longer.

YOU CAN GET THESE FROM STOCK At the moment we have a small stock of the popular Types 100-Q and 100-R VARIACS and can ship immediately: These models are rated at 2,000 va. The Type 100-Q supplies continuously adjustable voltages from zero to either 115 or 135 volts from a 115-volt 60-cycle line with a maximum output of 18 amperes; the Type 100-R supplies a maximum of 230 or 270 volts from either a 230- or 115-volt line with a maximum current rating of 9 amperes from a 230-volt input, or 4.5 amperes when used on 115 volts. Price of either model: $40.00.

** The trade name VARIAC is registered at the U. S. Patent Office. VARIACS are manufactured and sold only by General Radio Company under our U. S. Patent 2,009,013.*

MADE ONLY BY **GENERAL RADIO COMPANY**

Cambridge 39, Mass.
NEW YORK
CHICAGO
LOS ANGELES

EVERY PROPERTY essential to metal joining in electrical work is provided by SIL-FOS and EASY-FLO

ROTOR BARS brazed to end rings with SIL-FOS.

COPPER BUS BAR system brazed with SIL-FOS.

SWITCH BOX COVER fabricated by EASY-FLO brazing.

ELECTRONIC EQUIPMENT chassis fabricated with EASY-FLO.

HIGH CONDUCTIVITY—
SIL-FOS and EASY-FLO, the low-temperature silver brazing alloys, make joints equal in conductivity to the metals used for carrying current.

HIGH STRENGTH—
SIL-FOS and EASY-FLO produce electrical and structural joints that equal or exceed the parent metals in strength.

DUCTILITY—
SIL-FOS and EASY-FLO joints fully equal the parent metals in ability to withstand the stresses and strains of vibration, shock and temperature changes.

CORROSION RESISTANCE—
SIL-FOS and EASY-FLO joints offer strong resistance to the usual corrosive agents.

LOW TEMPERATURE—
The low working temperatures of SIL-FOS (1300°F) and EASY-FLO (1175°F) minimize the possibility of heat damage — which gives them a big advantage for joining light gauge metals.

ECONOMY—
The low temperature, extreme fluidity and silver content of SIL-FOS and EASY-FLO combine to save labor, alloy, gases and finishing. Cost per joint is surprisingly low.

BULLETIN 12-A—
gives full details plus a lot of helpful metal joining information. Write for a copy today.

ARMY E NAVY

HANDY & HARMAN

82 FULTON ST., NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

resenting manufacturers of electrical, radio and related lines. His company will cover the states of Texas, Oklahoma, Arkansas, and Louisiana, with headquarters in Dallas.

▶ JAMES A. BAUBIE has been appointed director of the public relations department of the Westinghouse Electric Corp. Since 1943 Mr. Baubie has been assistant manager of the department. He now assumes responsibility for the company's activities in the public relations field, which were formerly under the direction of G. Edward Pendray, assistant to the president. Mr. Pendray, as already announced in ELECTRICAL WORLD, has resigned to open offices in New York as a counsel in public relations.

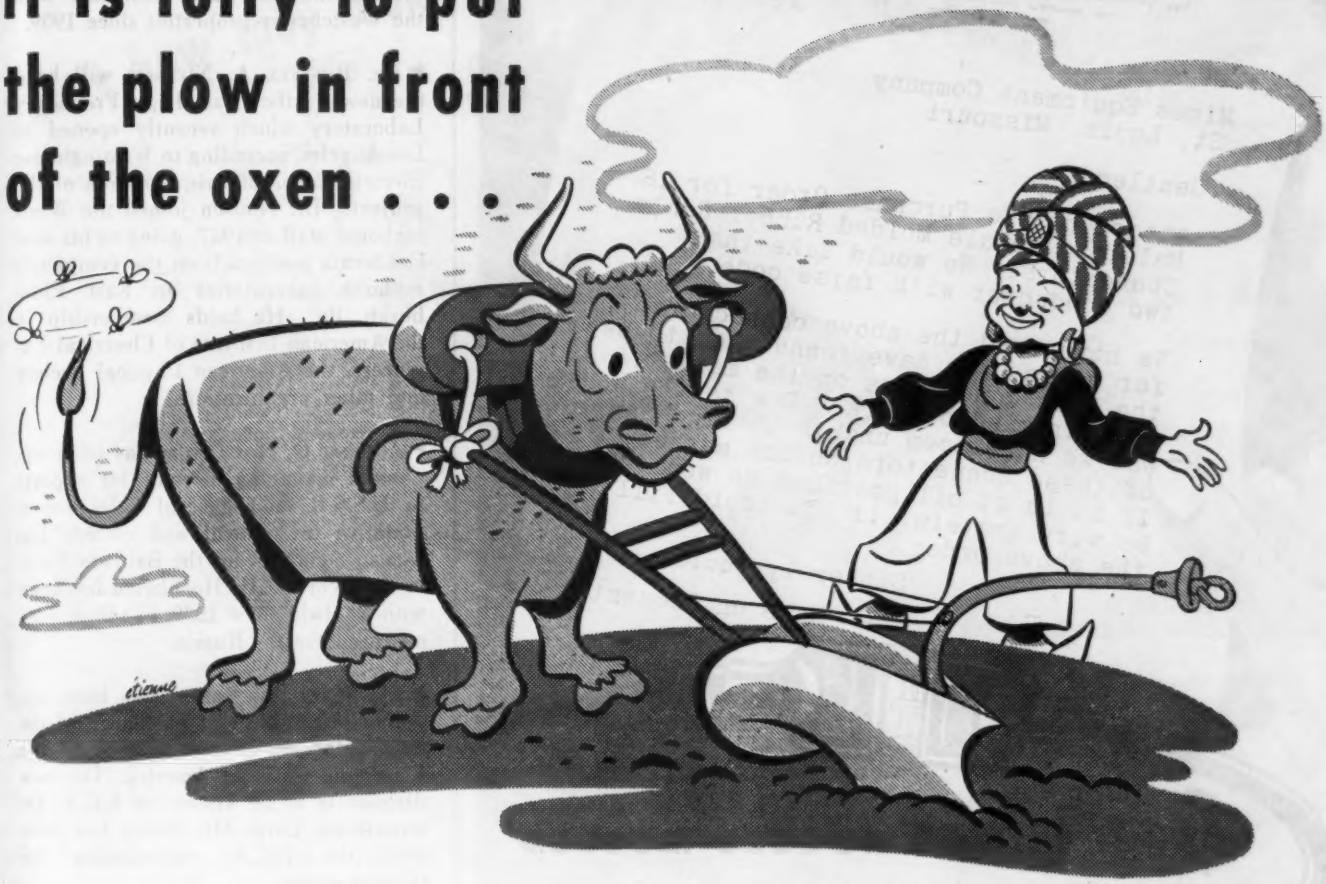
▶ CHRISTIAN STEENSTRUP, who developed the hermetically sealed refrigerator unit for the General Electric Co., and consultant for the company's refrigeration engineering division, has retired. He had completed 44 years of service with the company. With the hermetically sealed unit Mr. Steenstrup made refrigeration history and won for a second time General Electric's coveted Coffin Award for outstanding contribution to the electrical industry. He has to his credit a total of 113 different patent assignments. In 1940 the National Association of Manufacturers named him winner of its Modern Pioneer Award.

▶ K. W. MILLER, formerly director of research of the Utilities Research Commission, has been appointed chairman of electrical engineering research at the Armour Research Foundation of Illinois Institute of Technology. Prior to his appointment as research director of the Utilities Research Commission in 1931, Mr. Miller was employed consecutively by the marine engineering department of General Electric Co. in Schenectady, on the Skagit River hydroelectric project of the City of Seattle and by the Commonwealth Edison Co. In this last connection, he engaged in work on oil filled cables and in the field of reduction of sheath losses on single conductor underground power cables.

▶ CLAIR G. HENDERSON, for 21 years associated with Public Service Co. of Colorado in various capacities, has resigned as assistant treasurer and director of education to become manager of Arthur G. Rippey & Co., a Denver advertising company.

▶ JOSEPH P. MCLOUGHLIN has been elected treasurer of the Westchester Lighting Co. and Yonkers Electric Light & Power Co. to succeed ROBERT S. PRUYN, retired. Mr. McLoughlin will also retain his position as assistant

it is folly to put the plow in front of the oxen . . .



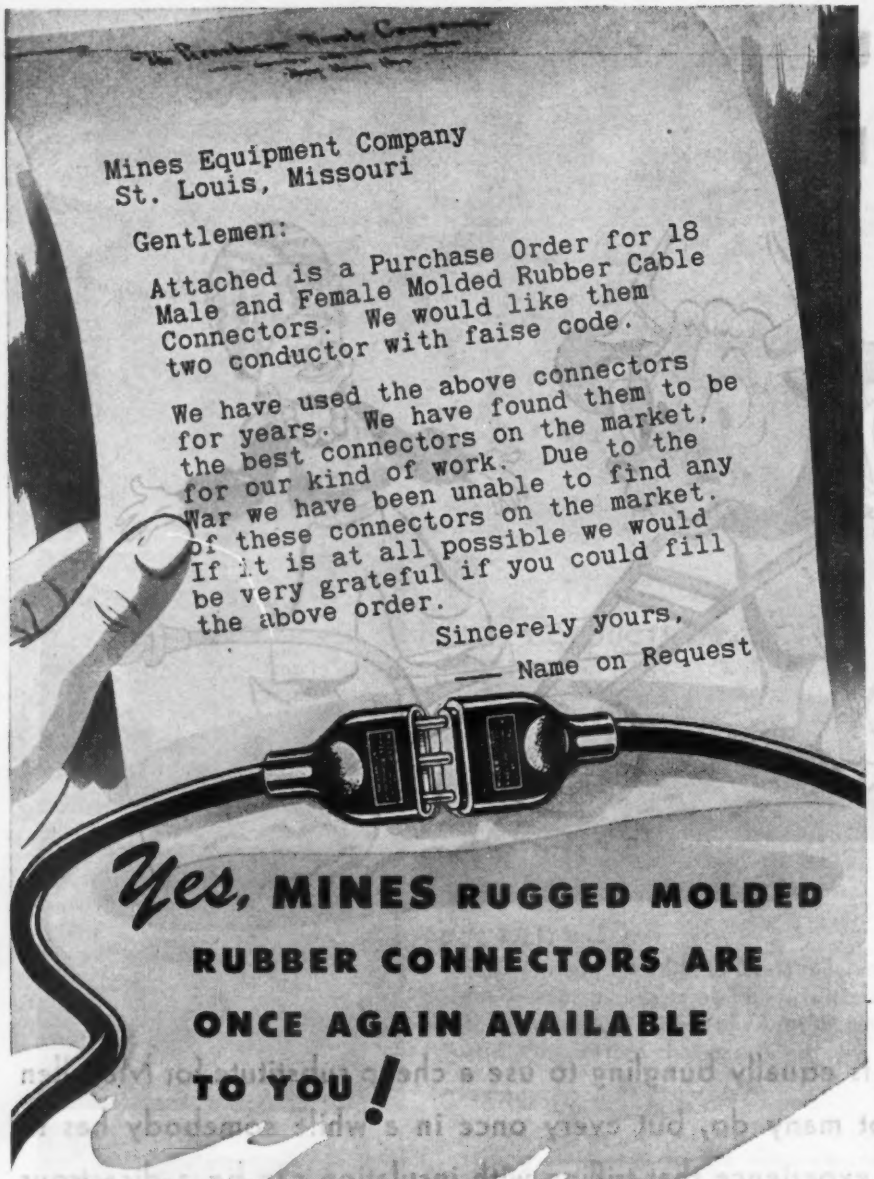
. . . and it is equally bungling to use a cheap substitute for Macallen Mica. Not many do, but every once in a while somebody has to learn from experience that trifling with insulation can be a disastrous experiment. The fact of dependability in Macallen Mica has been known to experts for more than 50 years.

When you think of MICA think of MACALLEN

the Macallen Company

16 MACALLEN STREET - BOSTON 27

CHICAGO: 542 W. Washington Blvd. CLEVELAND: 3005 Lander Bldg.


Mines Equipment Company
St. Louis, Missouri
Gentlemen:
Attached is a Purchase Order for 18 Male and Female Molded Rubber Cable Connectors. We would like them two conductor with faise code.
We have used the above connectors for years. We have found them to be the best connectors on the market, for our kind of work. Due to the War we have been unable to find any of these connectors on the market. If it is at all possible we would be very grateful if you could fill the above order.
Sincerely yours,
— Name on Request

Yes, MINES RUGGED MOLDED RUBBER CONNECTORS ARE ONCE AGAIN AVAILABLE TO YOU!

Now that military demands no longer completely tax our production facilities, we are able once again to supply Mines Molded Rubber Cable Connectors to all industry.

Mines Connectors when molded to electric cable become a part of the cable itself, giving a safe, efficient, water sealed connection. Mines Connectors can be furnished for splicing to cable in your own plant or molded to specified cable lengths.

Our engineers will gladly work with you in solving portable cable applications. Mines Connectors are available in single or multi-conductor, on capacities up to 5000 volts and 325 amperes.

For efficient, safe, flexible electric power transmission by cable, use Mines Connectors—"The Connector With The Water Seal."

WRITE FOR BULLETIN MC-106, showing many successful applications of Mines Connectors throughout industry.

MINES EQUIPMENT COMPANY

4235 Clayton Avenue • St. Louis 10, Missouri

secretary of the two companies. Mr. McLoughlin has been connected with the Westchester properties since 1909.

▶ DR. RUSSELL A. NIELSEN will head the new Pacific Coast High Frequency Laboratory which recently opened in Los Angeles, according to Westinghouse Electric Corp. officials, sponsors of the project. Dr. Nielsen joined the Westinghouse staff in 1937, going to his new California position from the company's research laboratories in East Pittsburgh, Pa. He holds membership in the American Institute of Electrical Engineers, the American Physical Society and other organizations.

▶ ADOLPH G. HOCHBAUM has been appointed managing director for exports to U.S.S.R. and general sales representative for central and eastern European countries for the Baldwin Locomotive Works. Mr. Hochbaum has been with Baldwin since 1939, handling various products for Russia.

▶ LAWRENCE M. BRAUN has been appointed vice-president in charge of the export division recently formed by the Electronic Corp. of America. The new division is to be known as E.C.A. International Corp. Mr. Braun has been with the E.C.A. organization for thirteen years.

▶ EMMONS B. COFFIN has been appointed head of motor division test work at General Electric's River Works in Lynn, Mass., having been head of all testing of motors in that plant since the fall of 1944. He joined the company in 1916.

▶ CARLISLE F. SMITH, for eleven years factory manager and vice-president of American LaFrance Foamite Corp., has joined the Ward LaFrance Truck Division of Great American Industries, Inc., Elmira, N. Y., in the capacity of executive engineer.

▶ HUBERT H. KRONEN has been appointed vice-president and general manager of RCA Victor Radio, S. A., Radio Corp. of American Brazilian subsidiary with headquarters in Rio de Janeiro. C. J. CHISHOLM has been named sales manager of the radio and appliances department, the position previously held by Mr. Kronen. Mr. Kronen first joined RCA in 1930 as district representative in the New York office of the former RCA Radiotron Co. He became Philadelphia district manager for RCA Victor in 1937, a position he resigned the following year to enter the security business. Mr. Kronen rejoined RCA Victor in 1943 and a year later was appointed to the position of sales manager of radio and appliances in the Interna-

That's how they make ONE type of Fiberglas*-Mica combination

Several processors were quick to realize that mica and Fiberglas each have advantages which, when combined, result in an insulation material with unsurpassed characteristics. That is why the combination of thin glass cloth with mica, for ground insulation, was one of the first applications of Fiberglas in the electrical industry.

Types of Fiberglas-Mica Combinations

Fiberglas-Mica combination insulation is available commercially in thicknesses from .004" to .030". The Fiberglas may be applied to one or both facings of the mica, and the thickness of the Fiberglas used may be varied.

For ease in using the material, where minimum space is a factor, Fiberglas may be applied to one surface of the mica, while "fish paper" is applied to the other. In all cases, the strength of the Fiberglas-Mica combination is in excess of any other type of reinforced mica of the same thickness. This is particularly important in the thinnest mica tapes used for conductor or coil insulation. Four mil thick Fiberglas-Mica Tape is nearly three times as strong as the same thickness of mica tape with silk or paper backing—thus reducing application time.

Typical Applications

Fiberglas-Mica combination materials are used wherever there is a need for maximum reliability under high temperatures, either internal or external; where mechanical service is most severe, where a maximum safety factor is required. Its chief use is as ground or slot insulation in motors and generators, as phase insulation in large a-c apparatus, or as coil insulation between high and low voltage sides of dry-type transformers.

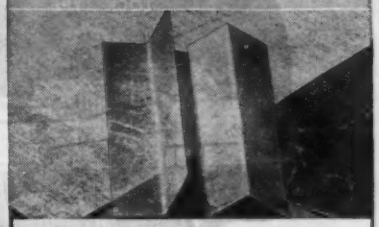
Complete Information

If you do not have complete information about Fiberglas-Mica combinations, write for the new EL 44-7 catalog, today. It also contains data on Fiberglas Tapes, Sleeving, Cord, etc. The name of the Fiberglas Insulation Materials Supplier located nearest to you will be supplied on request.

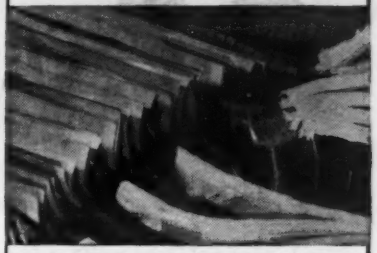
Owens-Corning Fiberglas Corporation, 1858 Nicholas Building, Toledo 1, Ohio.

In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.

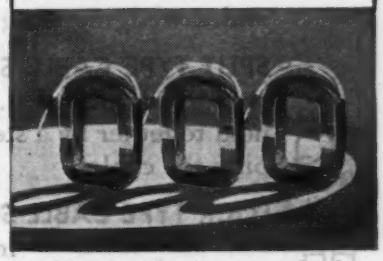
There is a **FIBERGLAS** Insulation Material for every need



Fiberglas-Mica Sheets or Tapes are available in thicknesses from .004" to .030"—with Fiberglas facings on one or both sides.



One of the chief uses of Fiberglas-Mica combinations is as ground or slot insulation in motors and generators.



Fiberglas-Mica has exceptional strength, permitting use of thinner tapes for conductor or coil insulation.

Write for catalog EL 44-7, today.

Each distributor of Fiberglas-base Insulation Materials has his own source of supply, since Owens-Corning Fiberglas Corp. does not process these materials.

FIBERGLAS

*T. M. Reg. U. S. Pat. Off.

ELECTRICAL INSULATION MATERIALS

O.Z. CABLE SUPPORTS

CONDUIT TYPE CABLE SUPPORT for regular installations. Consists of a malleable iron body which is screwed on the conduit in place of the iron bushing and a wedging plug for gripping the cables.

SPLIT TYPE CABLE SUPPORT for use where cables are already installed. It consists of a two piece body held together by a steel band and the plug for gripping the cables.

LOCK TYPE CABLE SUPPORT for supporting cables in a conduit in any position. A locking device secures the wedging plug to insure against loosening.

COMPOUND TYPE CABLE SUPPORT consists of a regular type support fitted with an extended collar to provide a compound chamber for sealing the end of the conduit.

O. Z. ELECTRICAL PRODUCTS
- CONDUIT FITTINGS
- CABLE TERMINATORS
- CAST IRON BOXES
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- POWER CONNECTORS

219

O.Z. ELECTRICAL MFG. CO.
262 BOND STREET • BROOKLYN, 2 N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES

tional Division. Previous to his present appointment, Mr. Chisholm was manager of the RCA Victor sub-contract department. He joined RCA in 1939.

► Francis X. Rettenmeyer has been appointed chief components engineer of the Federal Telephone & Radio Corp., Newark, N. J. affiliate of International Telephone & Telegraph Corp. Mr. Rettenmeyer's work will involve the engineering of Selenium rectifiers, quartz crystals, transformers and coils, special purpose and transmitting tubes, Intelin cables and other components. He joined Federal Telephone in July. Previously, he had been for ten years chief receiver engineer and staff engineer for the RCA Victor Division of the Radio Corp. of America at Camden. J. Granville Bates, Jr., has been named administrative assistant to the vice-president in charge of the radio engineering and sales division of Federal Telephone & Radio.

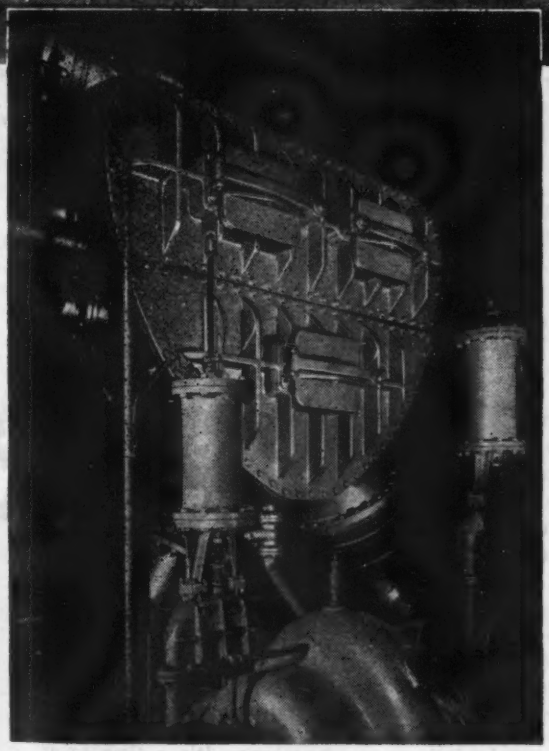
► G. A. Beck has been appointed manager of the industrial design division of the General Electric Co.'s electronics department. In this capacity, Mr. Beck will be responsible for the appearance design of products of all the divisions of the department, with headquarters at the Bridgeport, Conn., plant of the company. Since 1942, Mr. Beck has been engaged in the design of G-E radar and radio equipment for the Armed Forces. He became identified with General Electric in 1934 and worked for eight years on the design of radio receivers and home appliances.

► Andrew H. Heywood has been appointed manager of the motor application department of the Westinghouse Electric Corp., East Pittsburgh. Mr. Heywood joined Westinghouse in 1926 following graduation from Northeastern University, Boston, Mass. He served in industrial sales in Cincinnati, Ohio for ten years, then engaged in motor division sales activities until early 1944, when he was appointed assistant manager of the department he will now head.

► J. P. Woodward has been appointed director of industrial relations for Johns-Manville Corp. and will concentrate on an employment program for expanded post-war operations in this country, Canada and Mexico. A Johns-Manville executive for 23 years, Mr. Woodward succeeds John P. Syme, recently named assistant to Lewis Brown, president.

► W. D. Turnbull has been appointed general sales manager of Kennametal Inc., Latrobe, Pa. Mr. Turnbull has had more than 25 years of experience in

Outdoor POWER PLANT



The upper photo shows the Glendale turbine generator and the traveling gantry crane which serves all outdoor equipment. The lower photo shows the water-box end of the I-R surface condenser. The two circulating water pumps have gate valves which are operated by compressed air.

WITH INGERSOLL-RAND CONDENSING UNIT

For more than four years, the City of Glendale, Calif., has been operating a generating unit which is installed in the open—an arrangement which has proved practical and economical from every standpoint.

Aside from the inexpensive sheet-metal housing over the steam turbine, the equipment in this 20,000-KW outdoor installation is identical with that which would be used for an installation under roof.

The complete condensing plant, installed in a basement underneath the turbine generator, was supplied by Ingersoll-Rand. It consists of a two-pass horizontally-split surface condenser, a twin two-stage steam-jet air ejector, and two motor-driven single-stage centrifugal pumps which handle circulating water for the condenser.

Complete condensing plants have become a specialty with Ingersoll-Rand. Hundreds of power plants of all sizes are today enjoying the benefits of the unified engineering of the steam condensers, ejectors and pumps which comprise the modern I-R condenser plant.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

4-718

COMPRESSORS · CONDENSERS · TURBO BLOWERS · CENTRIFUGAL PUMPS · ROCK DRILLS · AIR TOOLS · OIL AND GAS ENGINES

For Dependable Soldered Connections

You get a perfect solder joint every time when you use Sherman Lugs, because we take a lot of pains to see that Sherman Lugs are clean, bright, and free from grease — inside as well as outside.

To prepare them for good soldering, Sherman Lugs, after they are made, are first tumbled in sawdust. Then they go through a special acid cleaning bath (bright finish) which removes all traces of corrosion, dirt, grease or other foreign matter. After that, they are rigidly inspected to make sure that every individual lug is perfect.

Sherman also has complete facilities for hot tinning and electro-tinning.

Specify Sherman Lugs on your next order. You'll find that it pays!

H. B. Sherman Mfg. Company
Battle Creek, Michigan

Also:

Solderless Lugs
Splicing Sleeves
Split Bolt Connectors
Wedge Grip Connectors
Ground Clamps and Fittings
Armor Rod Clamps
Jumper Clamps

Write for Sherman Catalog!

both engineering and sales of products used in diversified industries. He was associated with the Westinghouse Electric Corp. for many years, serving as manager of mining and petroleum sales and engineering; manager of the agency and specialties department and manager of the machinery electrification department, involving the application and sales of electrical equipment to the machine tool and other heavy machinery industries. For four years he was vice-president in charge of sales for Pomona Pump Co.

▶ SHELDON D. BAKER has been appointed as an executive consultant in sales and engineering for the Keller-Dorian Corp., New York, makers of metallized paper tapes for electrical wires and cables. Working with Frederick Kaiser, vice-president, Mr. Baker will aid in the development of metallized paper tape for the electrical industry generally, and particularly in the power cable and voice transmission fields. Mr. Baker is an electrical engineer with a broad background of sales and engineering experience in the electrical industry. He was formerly associated with the New York Edison Co., Electrical Research Products, Inc., Fairbanks, Morse & Co., Combustion Engineering Co., Inc., and Eagle-Picher Sales Co.

▶ CHARLES A. GRANGER, general manager of the Waterbury (Conn.) Tool Division of Vickers, Inc., has been named general manager of the Wheeler Insulated Wire Co., Bridgeport. Mr. Granger will also continue to serve the Waterbury company.

▶ H. M. LUPTON, JR., formerly active in New York advertising agencies, and president of Lupton, Reed and Co., Inc., advertising and marketing counselors, has been appointed advertising manager of the Electric Power Board of Chattanooga, Chattanooga, Tenn.

▶ LIEUT. HARVEY PICKER, USNR, recently returned to inactive status by the Navy, has been elected president of the Picker X-Ray Corp., New York, designer and manufacturer of X-ray equipment and accessories. Lieut. Picker, who for the past three years has been serving with the Navy liaison officer at Radiation Laboratory, Massachusetts Institute of Technology, was executive vice-president of the company until 1941, when he went on active duty with the Navy.

▶ PERRY DAVIS, assistant manager of the Texas Electric Service Co.'s Wichita Falls district since 1933, has been named district manager, succeeding the late Albert E. Kelly. Mr. Davis has been in the electric light and power

MEASURES AC or DC Current INSTANTLY

Instantaneously, by merely "snapping" the tongs around any electrical circuit, you can measure the current — BOTH A.C. and D.C. up to 800 amperes — without necessitating a break in circuit or insulation. Every electrician should have one. It's a time saver — production speeder. Weighs only 2¾ lbs. and is as simple to use as the illustration above suggests. Write today for our TONG TEST Bulletin describing its many time-saving applications.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave., N.E., Cleveland 14, O.

COLUMBIA
TONG TEST AMMETERS

The office manager, the artist, and the photographer!

(AND WHY THEY VISITED THE DRAFTING ROOM)

First time any of them had visited the drafting room!

But they'd heard that an Ozalid machine—recently installed to reproduce engineering drawings—could also reproduce—and simplify—much of their own work.

The Chief Draftsman obligingly listened to their accounts of varied problems and said:

"Ozalid can save you man-hours and dollars . . . as it does us."

He demonstrated how anything drawn, typed, printed, or photographed on translucent material could be reproduced in seconds—not minutes. AND be reproduced—not as a negative—but as any one of ten types of positive, Ozalid prints.

In different colors—black, blue, red, or sepia; on different base materials—paper, cloth, foil, or film.

He showed how these Ozalid prints could be used in many unique ways—for jobs beyond the scope of any other reproduction process.

THE ARTIST was intrigued by the manner in which advertising displays and folders could be made, and at the speed with which a layout could be altered and a new effect created.

Now, he said, he could do twice the work. (*He wondered if he could collect twice the pay.*)

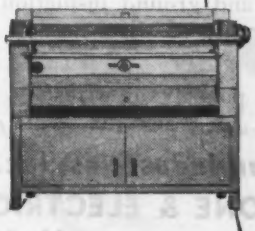
THE PHOTOGRAPHER was speechless when he saw Ozalid Dryphotos (continuous-tone photographic prints) produced in 18 seconds flat from a positive-film "master." Not one bath was necessary—just the same two steps employed to make all Ozalid prints—Exposure and Dry-Development.

THE OFFICE MANAGER, a man of great reserve, examined an Ozalid Rapid Black print of a typewritten report and said; "I'd swear this is the typed original . . . except that I can't smudge it."

OZALID

DIVISION OF GENERAL ANILINE & FILM CORPORATION
JOHNSON CITY, NEW YORK

Ozalid in Canada—Hughes-Owens Co., Ltd., Montreal



Suggestion:

If you have an Ozalid machine in your drafting room, stop by and ask for a demonstration. If you haven't adopted Ozalid as yet, write for *Simplified Printmaking*. It tells the whole story and contains samples of the 10 types of Ozalid prints you can make.

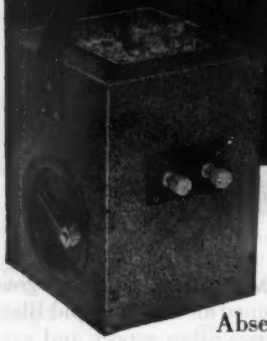
PAGE FENCE - Since 1883

• AMERICA'S FIRST WIRE FENCE •

You Can Order Your Fence Now

● Because of the importance of property protection, war restrictions on chain link fence are among the first to be lifted. Many will want the fence that was denied them, as they have wanted other things long scarce or unobtainable except on highest priorities. It will take months to catch up with demand. Therefore, it is advisable to place your order NOW for long-lasting Page Fence. The Page Fence Association member nearest you will submit cost estimates and book your order. If you do not know his name, write or wire to the Association office in Atlanta, Bridgeport, Chicago, Denver, Los Angeles, Philadelphia, Pittsburgh, New York, San Francisco, or Monessen, Pennsylvania.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE • BRIDGEPORT, CONN.



Announcing a Three-Way CIRCUIT TESTER

GIVES QUICK "YES" OR "NO" ANSWERS

Built to withstand rough treatment ... Simplifies acceptance testing of residential and commercial wiring.

Absence of commutators, slip rings, calibrated meters, rheostats or adjustment knobs in this compact circuit tester, simplifies both operation and maintenance . . . makes it cost less than conventional circuit testers. The self-contained generator develops peaks of 250 V.A.C. and tends to assure uniform tests regardless of generator speed. It requires but one operator and minimum instruction. Why not get the complete story? Write for details today.

DOES ALL THREE JOBS

✓ ***Audible Check:***

1. Tests wire and ground insulation
2. Tests continuity of wires

✓ ***Visual Check:***

3. Determines polarity of wires*

**A special indicator attachment is available for polarity tests.*

Great American Industries, Inc.

CONNECTICUT TELEPHONE & ELECTRIC DIVISION

404 Britannia St. **Meriden, Connecticut**

industry since 1923 and was assistant vice-president of Dallas Power & Light Co. prior to his association with Texas Electric Service Co.

▶ ROY C. ELLIS, formerly director of the War Production Board's radio and radar divisions, has been appointed vice-president of Raytheon Manufacturing Co., Waltham, Mass.

▶ ROBERT MILMOE has been appointed chief engineer of the Cole Electric Co., Los Angeles, Calif.

OBITUARY

▶ RICHARD J. BEAMISH, a former member of the Pennsylvania Public Utility Commission, died on October 1 of a heart attack at his home in Harrisburg, Pa. He was 76 years of age. Born in Scranton, Pa., Mr. Beamish was admitted to the Pennsylvania bar in 1890 and during the next three years served as an assistant district attorney of Lackawanna County. Later he engaged in newspaper work for a number of years. Mr. Beamish served as a member of the former Public Service Commission and as secretary of the Commonwealth during former Gov. Pinchot's second administration.

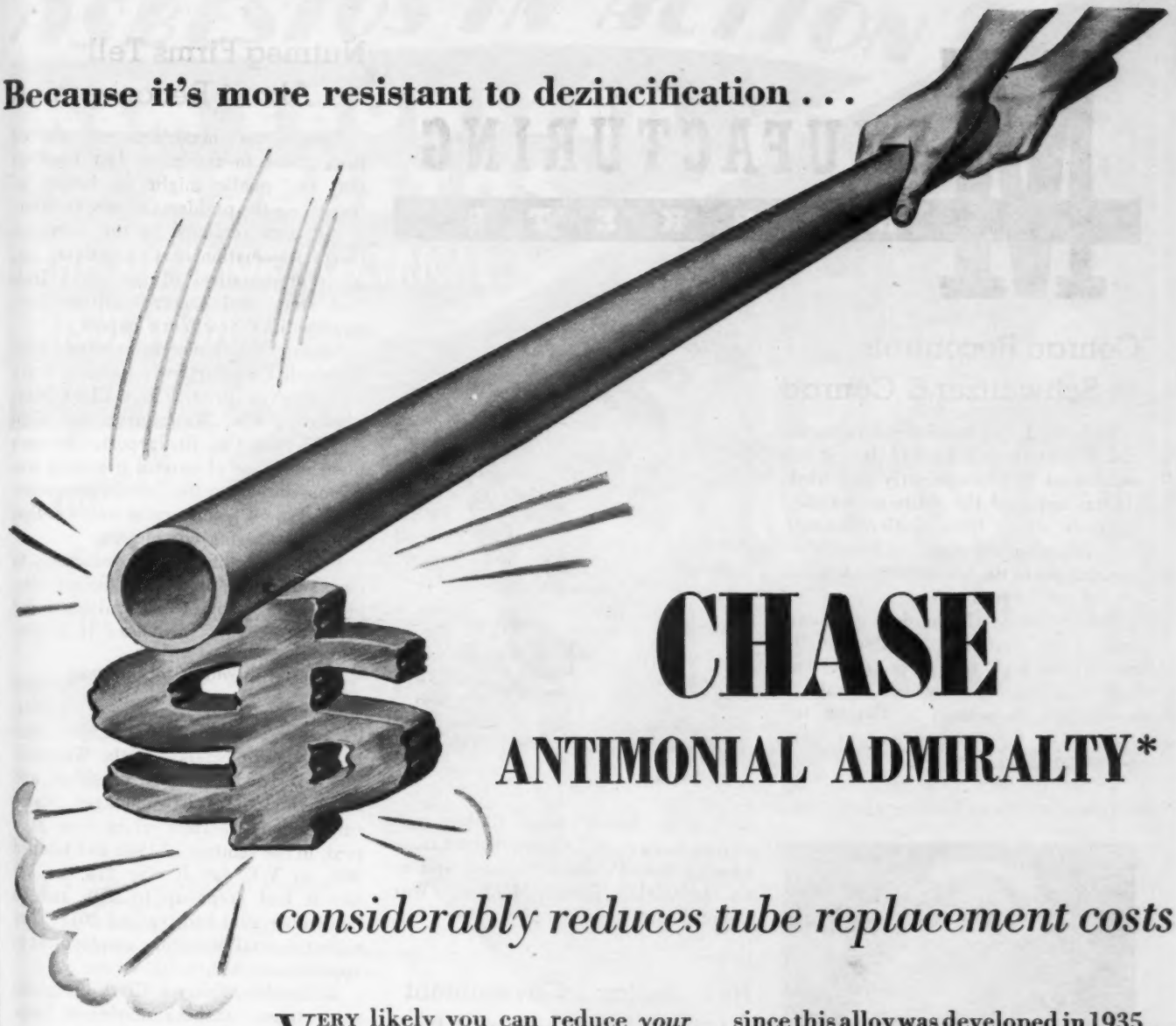
▶ EARL D. JOHNSON, for 25 years purchasing agent for the Central Arizona Light & Power Co., Phoenix, Ariz., died on September 16 at his home in that city at the age of 64. Mr. Johnson was born in Little Rock, Ark., and after experience in the electrical industry at Amarillo, Tex., he moved to Phoenix 26 years ago. He held the position of purchasing agent for Central Arizona Light up to his late illness.

▶ EDGAR S. ALLEN, director of safety for the Irvington (N. J.) Varnish & Insulator Co., with which he was associated for 23 years, died on September 30 at his home in Hillside, N. J., after an illness of several weeks. Active in the promotion of safety work in industry in New Jersey, Mr. Allen assisted in the establishment of the Newark Safety Council.

▶ WALTER J. NORMAN, for many years superintendent of the Electric Storage Battery Co. in Cleveland, died suddenly on October 1 at his home in that city. Mr. Norman, who was 54 years of age, had been identified with the company for 34 years. He was transferred to Cleveland from Detroit about 24 years ago.

▶ I. D. CLEVENGER, for the past fifteen years superintendent of the Warren (Ind.) municipal light and water plant, died on September 23 at Bluffton, Ind., of a heart attack.

Because it's more resistant to dezincification . . .



CHASE
ANTIMONIAL ADMIRALTY*

considerably reduces tube replacement costs

VERY likely you can reduce *your* annual tube replacement costs with condenser tubes of Antimonial Admiralty. This patented Chase copper alloy is extraordinarily resistant to dezincification. Yet it costs no more than plain Admiralty.

Millions of pounds of Chase Antimonial Admiralty have been installed since this alloy was developed in 1935, and not a single service failure has been reported from dezincification. Power engineers can readily appreciate what this longer tube life means in terms of replacement savings.

For full details phone your nearest Chase Warehouse or Service Office, listed below.

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CHASE BRASS & COPPER CO.

—Incorporated—
Waterbury 91, Connecticut
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

ALBANY† ATLANTA† BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON INDIANAPOLIS KANSAS CITY, MO.† LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WASHINGTON†

† Indicates Sales Office Only

This is the Chase Network—handiest way to buy brass

MANUFACTURING MARKETS

Conrad Recontrols Schweitzer & Conrad

Nicholas J. Conrad has resumed control of Schweitzer & Conrad, Inc., it was announced in Chicago early this week. He has acquired the entire outstanding common stock from Cutler-Hammer, Inc., and also has acquired from other interests all of the preferred stock which he did not formerly own.

The company will continue to manufacture in its plant in Chicago the S&C line of high voltage protective and switching equipment which is sold to more than 90 percent of the electric utilities in the country and to large industrial users.

Under the new program, Mr. Conrad, who was a co-founder of the company in 1910, and who sold his chief interest in 1930, again will resume active management as president. His son, John R. Conrad, who was educated at Yale and at the University of Chicago, will become vice-president. He has been identified with the aircraft industry since graduating from college. For seven years he has been with the Douglas Aircraft Co., the last two years as properties manager at the Long Beach, California, plant and has had supervision of manufacturing engineering, plant engineering and other important functions.

N. J. Conrad

Mr. N. J. Conrad, a former president of the Union League Club, served during the war as Chicago district manager of War Production Board and as an Industrial Panel Member, War Labor Board.

J. R. Conrad

•

New Zealand Government Will Make Combined Unit

The New Zealand Government has acquired rights to manufacture under a United States license a combined washing machine and refrigerator and will install equipment in state-owned rental houses now being constructed, Housing Minister Robert Semple has announced. New Zealand labor and materials will go into machines, which will come off the production line soon, Mr. Semple said.

•

Will Expand Facilities

Western Electric Co. is negotiating a lease for the Government-owned Studebaker plant in Chicago to augment the manufacturing facilities of the company's Hawthorne Works. Manufacturing operations are expected to start this year. The Studebaker plant, located less than four miles from the Hawthorne Works in the southwest section of Chicago, consists of single story factory and office buildings, power plant, oil and acid storage buildings.

Nutmeg Firms Tell About Reconversion

Connecticut manufacturers opened their doors to the press last week so that the public might be better informed on the problems of reconversion. A tour was arranged by the Manufacturers Association of Connecticut, Inc. for representatives of the press from that state and feature writers from metropolitan New York papers.

Among the concerns visited were Wiremold Co., Hartford; Landers Frary & Clark, New Britain; Lux Clock Manufacturing Co., Waterbury; and General Electric Co., Bridgeport. In each plant evidence of careful planning was demonstrated by the production activity, and plant reconversion status at that time was nearing completion.

The main difficulty in returning to normalcy is in obtaining sufficient competent labor. Engineers, draftsmen and skilled mechanics are hard to obtain.

Employment to Increase

In each instance the press representatives were conducted through the plants by company officials. At the Wiremold plant, D. Hayes Murphy, president, and John Davis Murphy, manager, stated employment at their plant was at a peak in the summer of 1942 and totalled 360, on V-E day it was 274, on V-J day it had crept up to 279, and on September 29 it had reached 307. They expect normal peacetime employment to approximate 330.

At Landers, Frary & Clark the guests saw ranges, washing machines, irons, heating pads and small appliances "rolling-off" the production line. Richard L. White, president, stated that "When V-J day came we were forced to shut down, but we did have reconversion plans; and the fact that we were manufacturing mechandise within 60 days after the war ended is conclusive proof of the existence of plans and a determination to meet the situation."

Fred Lux, vice-president, Lux Clock Mfg. Co., stated at the timer plant that six weeks ago the company employed 350 persons, that the figure now stands at 500, and that by January 1 it will exceed the company's prewar level of 950 employees. "When our program is completed about July 1, we anticipate having about 1,200 to 1,300 employees," he said. The output now exceeds 4,000 clocks daily and will reach the 10,000 normal peacetime volume as soon as the hiring and training is completed. Plans are formulated to bring this daily output up to 16,000 units.

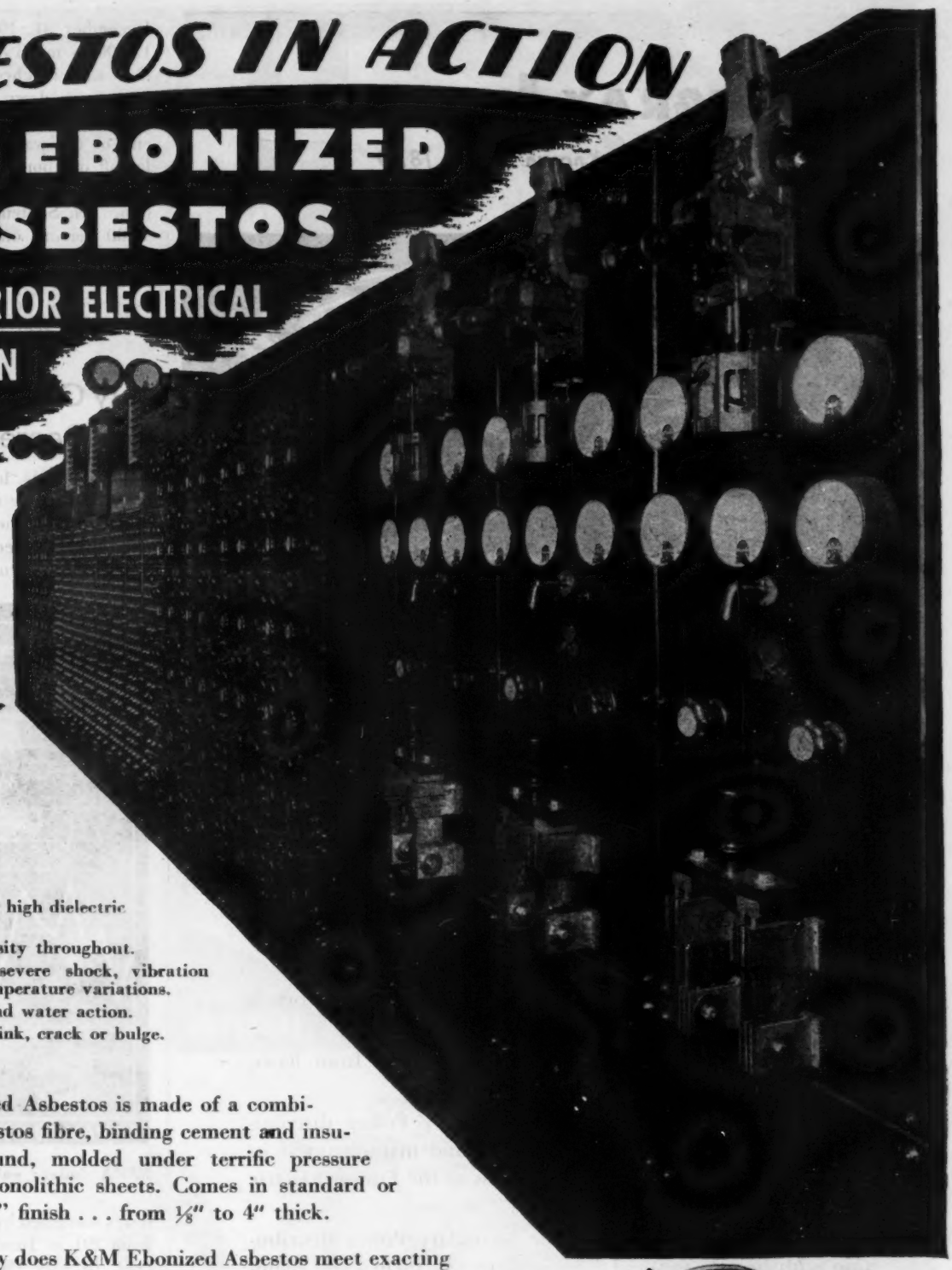
Employment in General Electric's Bridgeport works was about 12,700 on

ASBESTOS IN ACTION

K&M EBONIZED ASBESTOS

THE SUPERIOR ELECTRICAL INSULATION

...meets exacting demands



1. Exceptionally high dielectric strength.
2. Uniform density throughout.
3. Withstands severe shock, vibration and wide temperature variations.
4. Resists oil and water action.
5. Does not shrink, crack or bulge.

K&M Ebonized Asbestos is made of a combination of asbestos fibre, binding cement and insulating compound, molded under terrific pressure into strong monolithic sheets. Comes in standard or special "panel" finish . . . from ⅛" to 4" thick.

Not only does K&M Ebonized Asbestos meet exacting requirements for electrical switchboards, but it is ideal for bus bar runs, testing tables, cabinets, bench boards, compartment linings and many other types of electrical installations.

K&M Ebonized Asbestos is specially developed to meet the technical requirements of Underwriters Laboratories, Inc. when built into an assembled unit.

Nature made Asbestos . . . Keasbey & Mattison has been making it serve mankind since 1873.

ARMY E NAVY

K&M best in asbestos

KEASBEY & MATTISON

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HEMINGRAY INSULATORS

Favorably Known Since 1870

Power Insulators You Can Rely On!

Hemingray Insulators are made as you would like to have them made. Under exacting laboratory control!

Every batch of glass—every lot of moulded insulators is checked *hourly,* with various precision instruments.

That's why Hemingray Insulators are so free from flaws, so uniform in quality, so dependable.

There are ten Hemingrays for Primary Power distribution for voltages from 2,300 to 15,000 and manufactured in accordance with suggested specifications of the Edison Electric Institute.

There are ten Hemingrays for Secondary Power distribution with heights ranging from $2^{15}/_{16}$ to $5^{1}/_{32}$ inches and diameters from 2¼ to 3¼ inches.

Investigate! Hemingrays are sold by principal jobbers and are manufactured by Owens-Illinois, Hemingray Division, Muncie, Ind.

OWENS-ILLINOIS

HEMINGRAY INSULATORS

Telephone-Telegraph

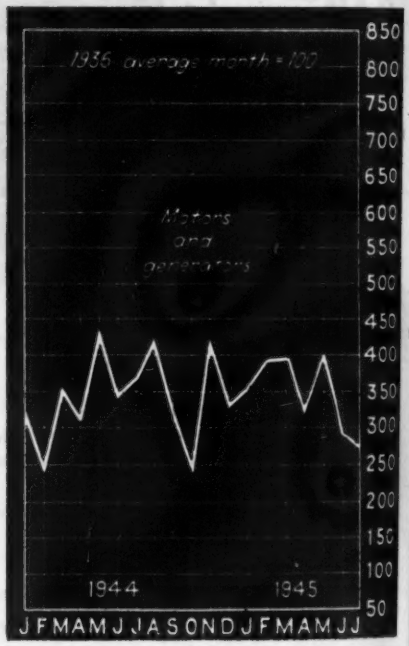
Export Agents: International Standard Electric Corporation, New York City

December 31, 1942 and hit a high of 13,700 in mid-1944, when peak production was reached. On V-E day this figure was down to 11,700 and by V-J day had dropped to 10,900. The abrupt end of the war necessitated temporary lay-off of about 2,000, but as the plant reconverted, the upward trend had begun. On September 27, the plant had 9,200 persons on the payroll, and it is expected that January 1, 1946 will find 10,300 employed. Another 1,300 are expected to be added by August 14, 1946—one year after V-J day.

•

July Generator Orders Decrease 4 Percent

New orders for motors and generators during the month of July dropped slightly under the June total, according to figures released by the National Electrical Manufacturers Association. The



NEMA Index, value of orders received

index compiled by NEMA dipped to 280 from 291 in June, a decrease of 4 percent. In July 1944, the index stood at 365, this year's figure, representing a drop of 23 percent.

The 1944 monthly indexes include an adjustment for cancellations reported up to December 31. No adjustment has been made for renegotiation of contracts.

•

Office Improvements Made

Roots-Connersville Blower Corp., Connersville, Ind., is making extensive improvements in its offices at the plant in Connersville. WPB approval was given to an addition to more adequately house the engineering department due

35° F. TEMPERATURE

Chicago "holding-room" refrigerated to 35° F. with 80% humidity, is illuminated by Guth QUICKLITERS inset in ceiling troughs. The cool-operating QUICKLITERS add little to the refrigeration-load. Meat is graded faster, resulting in increased annual capacity of the cooler. Most interesting is the fact that beef in this cooler brings higher prices; write for details.

0° F. TEMPERATURE

Salt Lake City, Utah, installation of QUICKLITERS in a cold-storage locker plant. Thermometer at room entrance constantly shows 0° to −5° F. Notice in photo that one row of 3 fixtures is less than 3-feet above the refrigerated coils. Owner of the plant is well satisfied; none of the lamps have failed, nor hesitated to light, after 800-hours service.

Guth *Quick-Liters*
TRADE-MARK

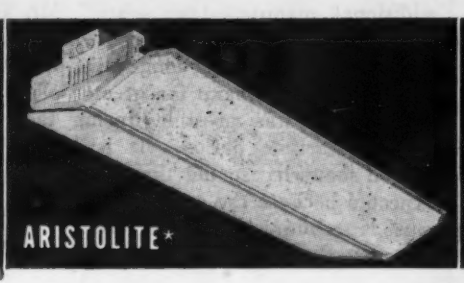
FOR

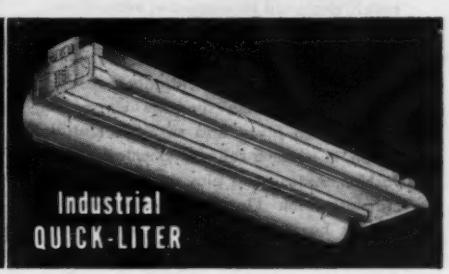
COLD-TEMPERATURE LIGHTING

COLD STORAGE LOCKERS, MEAT COOLERS, ETC.

Fluorescent lighting is *now* practical in refrigerated areas. Guth QUICKLITERS now in daily use, have proven their practicability. Besides affording high-quality, diffusing illumination, the use of Fluorescent in these areas adds little to the refrigeration-load due to inherent lighting efficiencies.

QUICKLITERS have other uses, too. The fact that *no Starter-Switches* are needed, is a tremendous saving in maintenance costs. Quick-starting, long lamp-life and operation at low and irregular voltages are QUICKLITER attributes. Write for further details.





*Available with QUICK-LITER Ballasts

Guth Quick-Liter
TRADE-MARK
NO STARTER SWITCHES
WILL OPERATE IN AN ICE BOX
The Original Starterless Fluorescent has proved itself in gruelling tests since July 1942!
LIGHTS INSTANTLY
PUSH
"STOCKED" COLD CATHODE
LONG LAMP LIFE
OPERATES AT IRREGULAR OR LOW VOLTAGE

OTHER *Quick-Liter* USES

FOR OFFICES

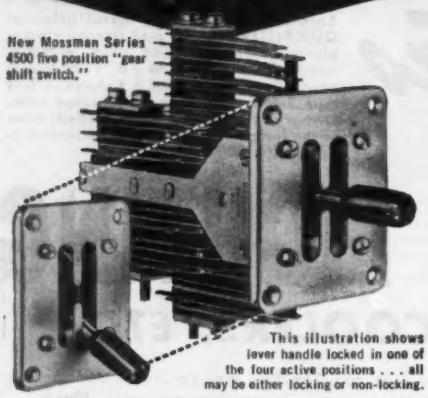
QUICK-LITERS for offices provide exceptional maintenance and operating features. A single unit, or an entire row, "lights at the flick of a switch" When a lamp goes out there is no guessing (as with conventional equipment) as there are no Starter-Switches in the QUICK-LITER system. Installation above was engineered by Mr. R. S. Milner, of Cleveland, Ohio.

FOR INDUSTRY

Because Starter-Switches *are not used* in the QUICK-LITER circuit, a great saving is afforded by reducing maintenance costs. In factories where power lines may be overloaded, irregular or low voltage conditions are solved; QUICKLITERS do *not* "go-out" even with Voltages as low as 85 Volts. Quick-starting of QUICKLITER is advantageous in many industrial applications.

2613 WASHINGTON AVE. **THE EDWIN F. GUTH CO.** ST. LOUIS 3, MISSOURI
LEADERS IN LIGHTING SINCE 1902

This
MOSSMAN
"Gear Shift Switch"
Adds Choice of
Five Positions to
Unusual Circuit
Flexibility



New Mossman Series 4500 five position "gear shift switch."

This illustration shows lever handle locked in one of the four active positions . . . all may be either locking or non-locking.

● This new Mossman Switch—Series 4500—is a five position heavy duty lever switch, designed to meet new, unusual requirements for precision switching.

Series 4500 is built of U. S. Navy-specifications material. Rigidly braced, heavy brass frame supports chromium plated latch plate and spring-actuated piston, in which a roller is mounted clevis fashion. Axles, stop pins and piston are stainless steel. Plated phosphor bronze springs have spun-in heavy duty silver contacts.

Four independent contact spring pile-ups, each actuated either locking or non-locking. Action of the different positions may be changed by inserting or removing stop plates beneath the escutcheon. Special safety latching feature, available with special housings, wiring and other features to meet your requirements.

Send for the
MOSSMAN CATALOG
Covers entire line of heavy duty, multiple circuit lever switches, turn switches, push switches, plug jacks and special switching components.

DONALD P. MOSSMAN, Inc.
612 North Michigan Avenue
Chicago 11, Illinois

MOSSMAN
Electrical Components

to the heavy volume of war work then being handled. Now that the war is over, and WPB restrictions are being lifted, it is planned to modernize the rest of the offices.

•

Reliance Starts Work on $350,000 Plant

Ground was recently broken for an extension to the Ivanhoe Road plant of the Reliance Electric & Engineering Co., Cleveland, Ohio, James W. Corey, president, has announced. The new plant, which with equipment will cost approximately $350,000, will be located north of the present main plant.

The new building will provide approximately 44,000 sq. ft. of new manufacturing space which for the present will be used for storing finished parts, prior to their assembly into the company's electric motors, generators and specialized industrial machine drives.

Such storage, originally provided for within the Ivanhoe Road plant, has occupied a floor of the Euclid-13th Street garage during the war period when every available foot of plant space was needed for vital Navy, Maritime and industrial production.

"Expanding peacetime schedules already indicate we shall have need for additional manufacturing space," Mr. Corey said. "This addition to our plant," he added, "is part of a long-range program which will make for greater efficiency than was possible during the hurried wartime period. It is being started somewhat sooner than had been expected because the space now leased must be relinquished to the Navy.

•

General Mills Appliance Production by Xmas

Preliminary production of General Mills' new home appliances is scheduled to start on a limited scale around Christmas, Harry A. Bullis, president of the company, has announced. National distribution will be opened district by district, with shipments to retail dealers from distributors' stocks to be made in the first district beginning sometime in April, 1946.

•

Purchases Plant Site

Announcement has been made by R. B. Marshall, president of Electromaster, Inc., Detroit, that the company had purchased 23 acres in the northwest section of Mount Clemens, Mich., on which it is planned to erect a new factory and office building.

A MASTER-LIGHT FOR EVERY NEED

360° REPAIR CAR SEARCHLIGHT
- REPLACES 2 SIDE LIGHTS!
- BEAM DOESN'T PASS DRIVER'S VISION TO BLIND HIM IN FOG.
- SUPER-POWERED YET WON'T BLIND APPROACHING DRIVERS BECAUSE MOUNTED HIGH.
- MAKE SUPERIOR FOG LIGHT.
- DRIVER OR PASSENGER CAN POINT BEAM AS EASILY AS POINTING A PISTOL.

SEND FOR NEW
FREE EMERGENCY LIGHTING
BULLETIN

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MFG. CO.
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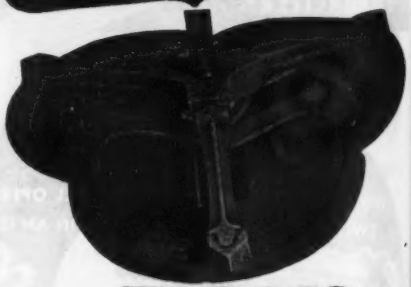
Boston 45, Mass.
MASTER★LIGHT★MAKERS

EVERSTICK
ANCHORS...



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INSTALLATION

The exclusive Everstick nut housing locks the Anchor firmly on the rod. This speeds up installation. Plates are so designed, that they expand easily into undisturbed earth, and extra holding power is achieved. Made of tough, rust-resistant malleable iron. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

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For a great many years, small freight elevators made up the greatest part of Otis business. Today, they still constitute a large percentage of Otis sales.

Small or large, for two stories or twenty, with Otis freight elevators you are assured of dependable and economical performance.

Your Otis representative is ready now to consider your requirements and to recommend the elevator equipment best suited to your needs. For the finest in vertical transportation tomorrow, call your Otis representative TODAY.

Otis ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES

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Start now to earn the bigger pay in electrical repair

Was there ever such an opportunity to get started in electrical maintenance and repair—and at top-notch wages? Are you ready—with experience and ability—to cash in on it? Others are getting just the sort of background needed—quick! practical!—to handle the great variety of electrical maintenance and repair work TODAY—from this well-known electrical library. You can too!

Electrical Maintenance and Repair Library

5 volumes, 2042 pages, 1721 illustrations

Gives you the "know-how" to tackle any wiring or motor job. Five books show you HOW—to install all types of motor and generator units—to inspect and repair motor starters and generators—to diagnose motor and generator troubles—to figure new windings for old cores, DC and AC windings—to test armature windings, test induction motors, etc., etc. The new book is full of trouble-shooting charts that show quickly symptoms, causes, specific remedies, etc.

Includes trouble - shooting book

Now in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book giving helpful maintenance information, special trouble-shooting charts, explanations of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

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Field Reports on Business

Reconversion is going on rapidly at industrial plants throughout the country and electrical equipment is moving forward at a fair pace. Installations of lighting fixtures, outdoor advertising and wiring for store displays are promoting sales of electrical supplies. Retail trade is running well ahead of last year.

NEW ENGLAND

Orders for small motors are being received from textile mills at a steady rate. Although facing uncertainties in the labor situation and lacking raw material supplies for mills, reconversion is going on rapidly in Rhode Island and Massachusetts plants and electrical equipment is moving forward at a fair pace. One well-known manufacturer's representative points out that one of the strongest small motor buying surges is starting among textile companies in this area.

Installation of lighting fixtures, outdoor advertising and wiring for store displays are promoting sales of electrical supplies. During September the applications for wiring permits in Boston more than trebled those of August. Boston's fishing fleet is adding trawlers equipped with radio communication. Eastern Massachusetts Street Railway will spend $1,000,000 for new buses. The Fitchburg, Mass., plant of General Electric expects to reach full production of small steam turbines about December. Boston School Committee has authorized the purchase of sound and moving picture apparatus for city schools, and Suffolk and Middlesex county offices will be equipped with photostat reproduction units in the near future.

Public Service of New Hampshire has built 158.3 miles of rural electric lines this year and expects to increase this to 210 miles by December 31. Western Massachusetts Electric will extend its system to include Savoy and also to serve customers in the Ludlow area.

Connecticut manufacturers of appliances are converting plants for domestic supplies. Landers, Frary & Clark, New Britain, Conn., are turning out refrigerators, ranges, and washers at the rate of 300 units each per week. Warren Telechron clocks are now on retail counters in Boston. The Techna Company, Bayonne, N. J., has acquired a new factory in West Warren, Mass. and will begin the production of plastic products immediately.

CHICAGO

Exceptional activity in industrial reconversion, coupled with a stalemate in residential construction, is the electrical contracting picture here. Contractors and utility linemen are as busy as they ever were during the peak of the war program. What new construction there is is mainly industrial.

The activity in the industrial field is one factor contributing toward the quiet residential situation, since it makes labor scarce and materials high, but other factors are equally significant—OPA regulations, uncertainty of labor costs, and the shortage of draftsmen and technical men required by architectural and engineering firms. These men are evidently not being released very rapidly by the armed forces. Opinion is that the relaxation of building and remodeling credit restrictions on October 15 will not help to any great extent.

Pressed Steel Car Co.'s Hegewisch plant is being reconstructed and otherwise prepared for the production of household appliances, including heating and refrigeration equipment and air conditioning units.

Major projects exemplifying the industrial construction boom are: Liquid Carbonic Corp., $100,000 project; Corn Products Refining Co., Argo. Ill., four-story pilot building; Deepfreeze Division, Motor Products Corp., North Chicago, "a substantial expansion program"; American Colortype Co., $400,000 addition; Commercial Solvents Corp., $350,000.

NEW YORK

Durable consumers' goods are beginning to come from the factories. A survey made by the War Production Board of 3,750 manufacturers in the durable goods industries which now face reconversion indicate that by December the production of these companies will be 112 percent higher than the 1939-41 average, while by June 1946 it will be 187 percent higher.

Civil engineering construction volume totalled $74,731,000 last week, the third highest volume reported in 1945 according to reports to *Engineering News-Record*. The week's total was 16 percent below the 1945 high of the preceding week, but topped the corresponding 1944 week's total by 182 percent. Private construction, though 13 percent under the five-year high of the preceding week, was 1,703 percent above the volume for the 1944 week. Public construction was 25 and 36 percent lower, respectively, than the preceding week and a year ago. The week's construction brought 1945 volume to $1,570,985,000 for the 40-week period, a 12 percent increase over the $1,406,091,000 reported in 1944.

Cooler weather stimulated retail trade in the Metropolitan area last week, particularly in apparel and accessories. Department store volume was estimated at about 10 percent above last year.

PACIFIC COAST

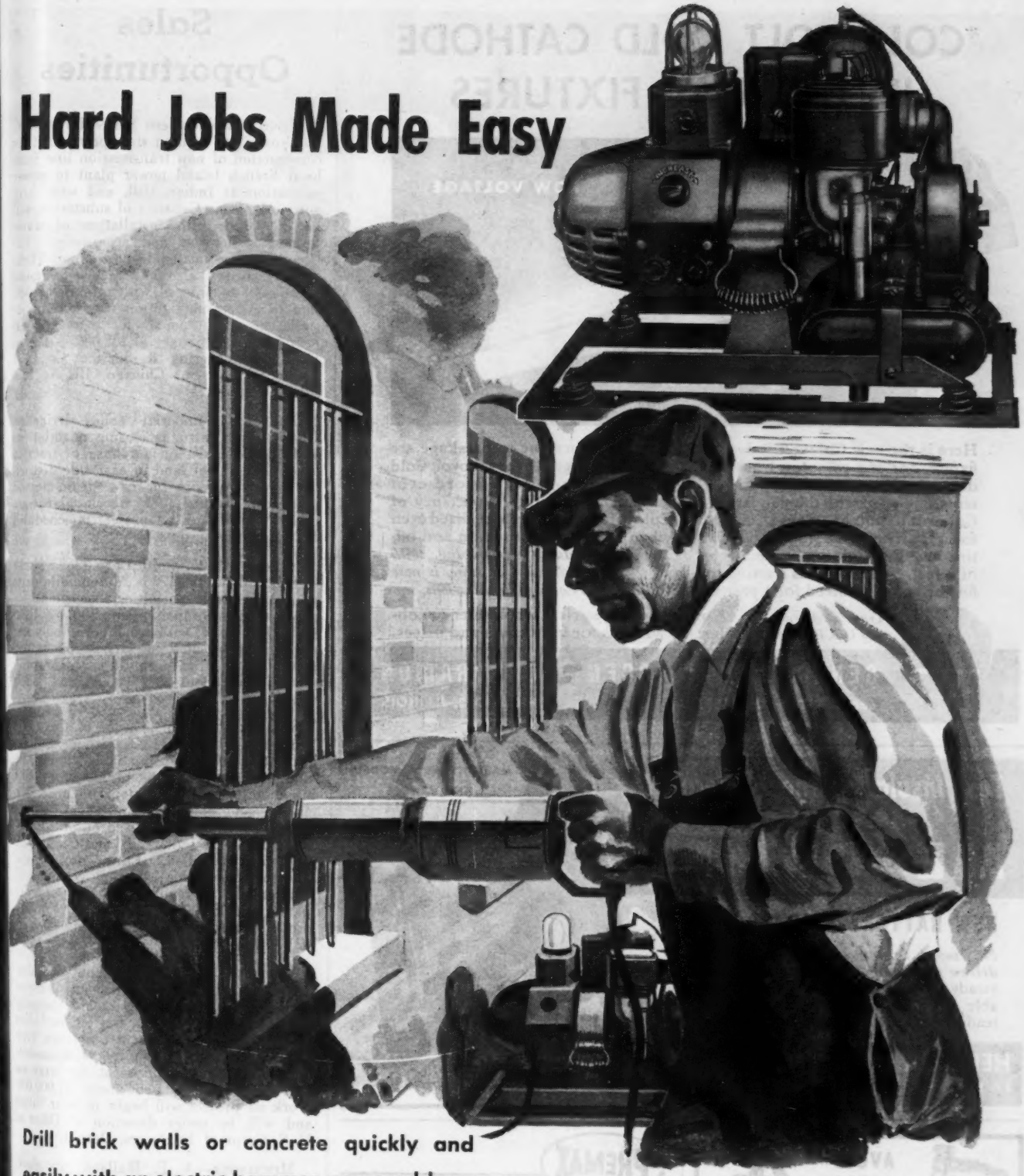
New electrical work planned includes lines near Circle, Mont., to serve 1,250 customers for which $550,000 has been lent by RFC and $5,000,000 may be borrowed, and reconstruction of municipal plant at El Centro, Calif., to consolidate recently acquired properties.

Westinghouse has begun construction of three 108,000 kw. generators for Grand Coulee expansion now revitalized. Prospective miscellaneous construction covers much long-delayed public work such as $1,500,000 Capitol Building for Santa Fe, N. M.; $2,500,000 expansion of Long Beach airport, for which bonds are to be voted, and a building bond election of $3,500,000 for Richmond.

Government construction will be diverted to such new channels as Reclamation Bureau's ten-year $600,000,000 plan, covering 12 major projects in Arizona, largest being $333,000,000 for a 1,100,000-kw. system.

Orders include $30,000 electronic tubes for Signal Corps; electrical furnaces; many scattered orders for ship cable, an order from Pacific Gas & Electric Co. for 600 distribution transformers, sizes 25 to 100 kw. inclusive; and 60 assorted motors, sizes 30 and 50 hp. for a pellet mill.

Hard Jobs Made Easy



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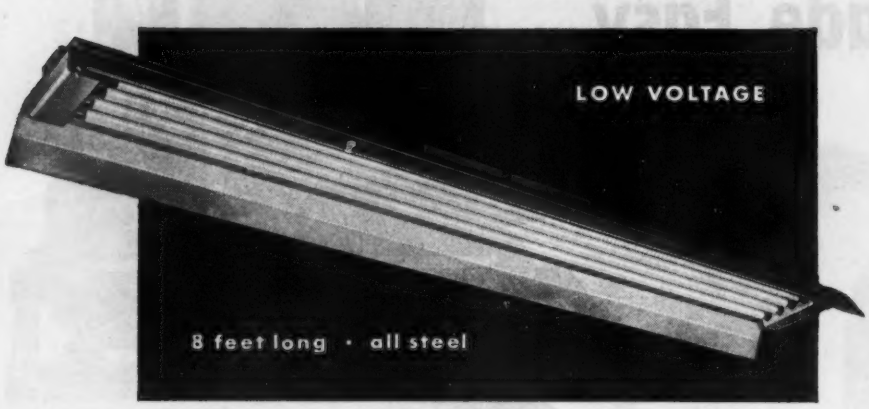
*COLOVOLT COLD CATHODE INDUSTRIAL FIXTURES



Here is the new Colovolt industrial fixture, one of a complete line of industrial and commercial "packaged" units. Equipped with the standard 93" Colovolt 10,000 hour lamp, Colovolt fixtures may be used singly or in continuous line lighting in multiples of 8 feet. Instantaneous starting, no flickering, guaranteed for 1 year except for failure due to breakage are extra advantages of the Colovolt Cold Cathode low voltage fluorescent lamp. The long life expectancy of Colovolt lamps may be realized even when constantly turned on and off, and *pre-scheduled re-lamping, with no loss of production or time, is now possible with Colovolt installations.*

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Contact your electrical wholesaler or jobber, or write us for full details and prices.

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Test Insulation the Modern Way with a MODEL B-5 MEGOHMER

NEW BATTERY-VIBRATOR TYPE

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WRITE FOR BULLETIN No. 430-E

AVOID CABLE ABRASION with STAPUT FAIRLEADERS

"Rubbing at the duct mouth can be reduced by installing fairleaders on the cables at this point." — from Electrical World, May 29, 1943 (Cables —How to Make Them Last).

These non-corrosive alloy cable shields clamp in place to take wear at duct mouth. Easily and safely installed without interruption of service. Eliminate expensive repairs. Use STAPUT FAIRLEADERS. *Write for free catalog.*

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Are now available in many Standard Designs . . . or may be had in any special design desired. Write for details.

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Sales Opportunities

WISCONSIN—Northern States Power Co., La Crosse, has secured state permission for construction of new transmission line from local French Island power plant to power substation at Indian Hill, and will carry out work soon. Capacity of substation will be increased, with installation of transformer, switchgear and accessories. Entire project estimated to cost about $150,000. Company also has received similar permission to proceed with proposed addition to generating station noted, with installation of equipment for increased capacity. Cost about $1,285,000. Public Utility Engineering & Service Co., 231 South LaSalle St., Chicago, Ill., is consulting engineer.

CALIFORNIA—Imperial Valley Irrigation District, El Centro, is closing negotiations with city officials for purchase of tract of about 90 acres of land in east side district, to be used as site for new steam-electric generating station, for which plans are under way. Work on project is scheduled to begin at early date.

ILLINOIS—A. O. Smith Corp., 3533 North 27th St., Milwaukee, Wis., automobile parts and other steel specialties, has plans for new one-story branch plant, 300 by 1,200 ft., at Kankakee, with machinery, tools and electrical equipment for large capacity. A power plant will be built. Entire project will cost about $2,000,000. Erection is scheduled to begin soon.

NEW YORK—Bethlehem Steel Co., 1915 Hamburg Turnpike, Lackawanna, Buffalo, has authorized expansion in local mill, including large additions to blooming mill, billet mill and other departments. Machinery and electrical equipment will be installed for heavy increased output. Power plant will be enlarged and additional equipment installed. Entire project will be carried out over a period of about 12 months, and is reported to cost approximately $20,000,000. Edward F. Entwisle is manager at local works. Main offices are at Bethlehem, Pa.

MICHIGAN—War Department, Washington, D. C., has authorized plans for new combat and transport vehicle laboratory at Detroit Tank Arsenal, Detroit, including changes in certain present buildings, erection of additional structures, with machinery and electrical equipment for large capacity. Cost estimated about $7,000,000. Work on project will begin in near future and will be under direction of Office of U. S. Corps of Engineers, Detroit.

MINNESOTA—A. E. Wallace, city clerk, Jackson, will receive bids until 8 p.m., October 23 for extensions and improvements in municipal power plant, including installation of additional equipment. Jesse B. Harris Co., Wesley Temple Bldg., Minneapolis, Minn., is consulting engineer.

INDIANA—Board of Public Works, City Hall, Frankfort, will receive bids until November 6 for extensions and improvements in municipal power plant, including installation of new boiler, economizer superheater, stoker, soot blowers, forced and induced draft fans, fly ash collecting equipment, two closed-type feedwater heaters, boiler feedwater make-up evaporator, coal and ash handling equipment, dust collecting apparatus, two motor-driven centrifugal pumps and accessory equip-

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The manufacturers' Briefalog Section is a particularly valuable feature. It includes 527 pages of product data, but due to the unique *Briefalog method of treatment, these pages are equivalent to over 1,500 pages of catalog data handled the old way. You see, the Briefalog was originated by E-B-R. It is the modern way of presenting product data—with essential material all there, but excess "sales talk" or over-long description and detail *left out.*

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Truck Winch & Crane Equipment
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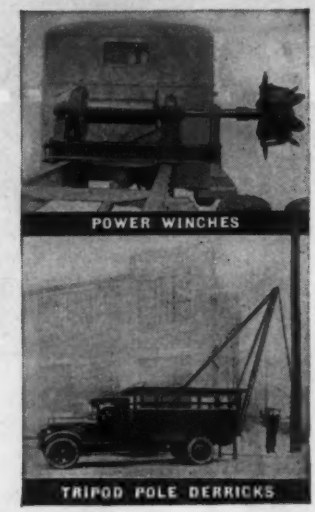

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Please send details and 48-page illustrated catalog.
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ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

ment. Froehlich & Emery Engineering Co., Toledo Trust Bldg., Toledo, Ohio, is consulting engineer.

CALIFORNIA—Imperial Irrigation District, El Centro, will receive bids until October 30 for reconstruction and consolidation of El Centro city electrical distribution system, including removal of duplicating facilities, conversion of all former lines of California Electric Co., from 2,300 to 4,160 volts, and reconstruction of all lines and facilities where neither of existing systems is adequate. The work includes both the overhead and underground lines (Specifications 118).

OREGON—Municipal Water and Light Department, McMinnville, has plans under way for extensions in electrical distribution system, including new lines for street-lighting system. Cost estimated about $125,000. Proposed to carry out work by day labor, with municipality furnishing all equipment, early in 1946. H. M. McGuire, general superintendent, in charge.

CALIFORNIA—Regional Office, Bureau of Reclamation, Sacramento, has prepared detailed list of hydroelectric power projects in Central Valley basin area for which plans will be available as soon as necessary appropriations are authorized. Report has been filed at main offices, Washington, D. C., and funds are expected to be made available in near future. Sloughouse power plant, American Falls, 16,000-kw. capacity, $1,500,000; Nashville power plant, Sosumes dam, 18,000-kw., $1,500,000; Table Mountain power plant, Table Mountain dam, Sacramento County, 45,000-kw., $45,000; New Bullards Bar power station, North Yuba River, 60,000-kw., $3,500,000. Also, construction of portion of transmission system in area noted, to cost about $14,000,000.

CALIFORNIA—Holly Sugar Corp., Colorado Springs, Colo., has plans maturing for new beet sugar refinery near Imperial, where large tract of land has been secured. It will comprise several large one and multi-story units for processing, bagging and other divisions, to be equipped for initial daily capacity of 2,400 tons of raw material. A power plant is planned. Entire project reported to cost over $1,500,000, with machinery and electrical equipment. Company is now operating branch mill on Dyer Rd., Santa Ana; Robert Brown is Southern California agricultural manager.

MISSOURI—General Motors Corp., General Motors Bldg., Detroit, Mich., has leased former airplane bomber plant of North American Aviation, Inc., at Kansas City, owned by government, for period of five years, and will take possession at early date. Plant will be converted for assembling of Buick, Oldsmobile and Pontiac automobiles with installation of machinery and electrical equipment for working force of about 5,000 persons. Cost reported over $1,500,000.

TEXAS—Carnation Co., 3003 D'Amico St., Houston, plans expansion in plant for milk processing department, fresh milk division, ice cream-manufacturing department and other divisions, consisting of one or more new multi-story buildings, with machinery and electrical equipment for large increased output. Cost estimated about $1,000,000. Finger-Rustay, National Standard Bldg., Houston, are architects. Main offices at 715 North Van Buren St., Milwaukee, Wis.

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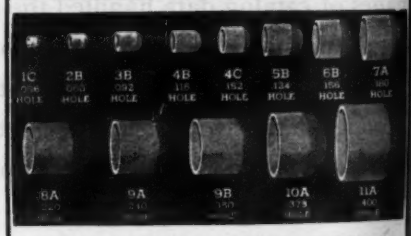
Electrical Products

Quotation on request
SOLAR ELECTRIC CORPORATION
WARREN, PENNSYLVANIA



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Send for Cat. #1, Sec. 8

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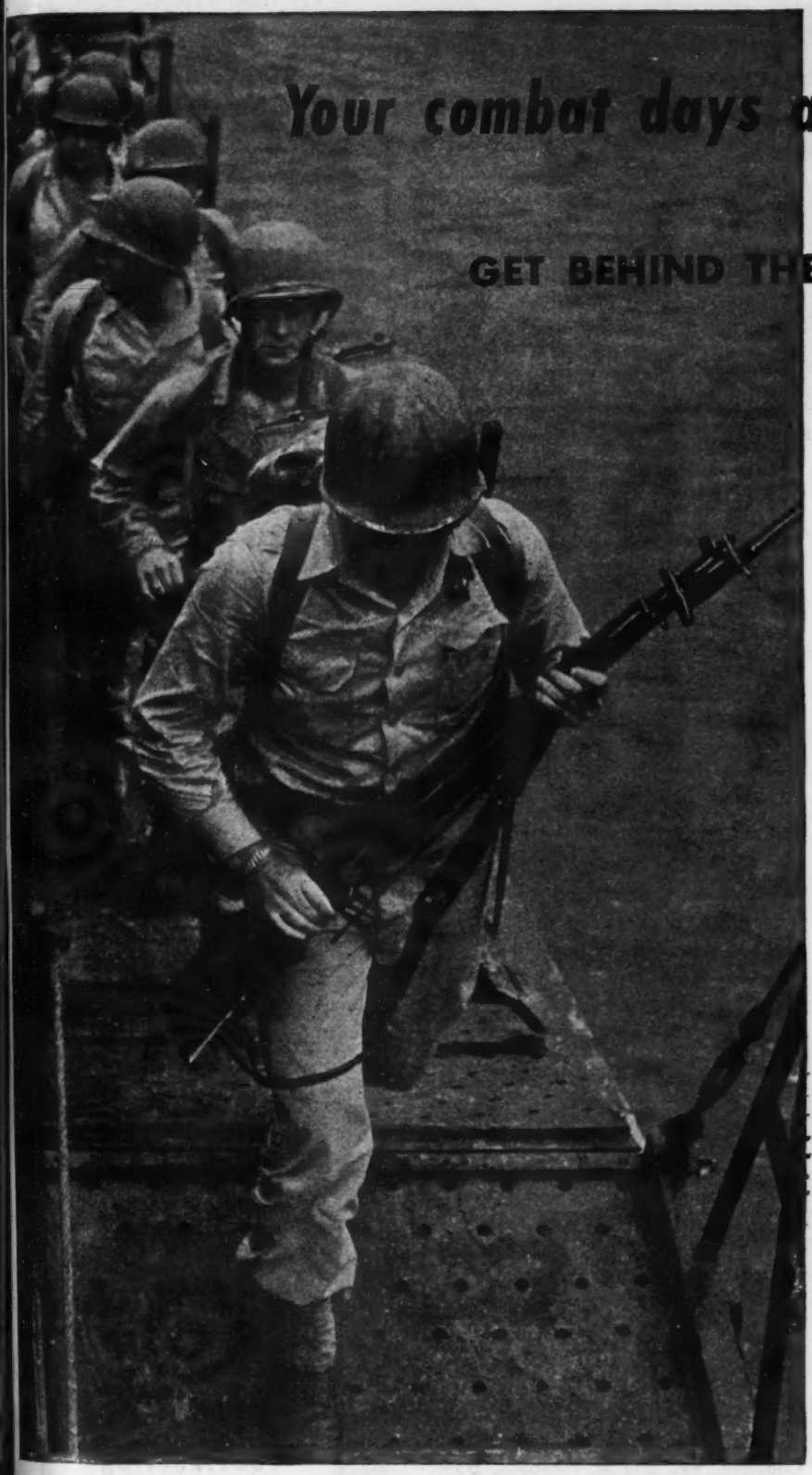

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ELECTRICAL WORLD

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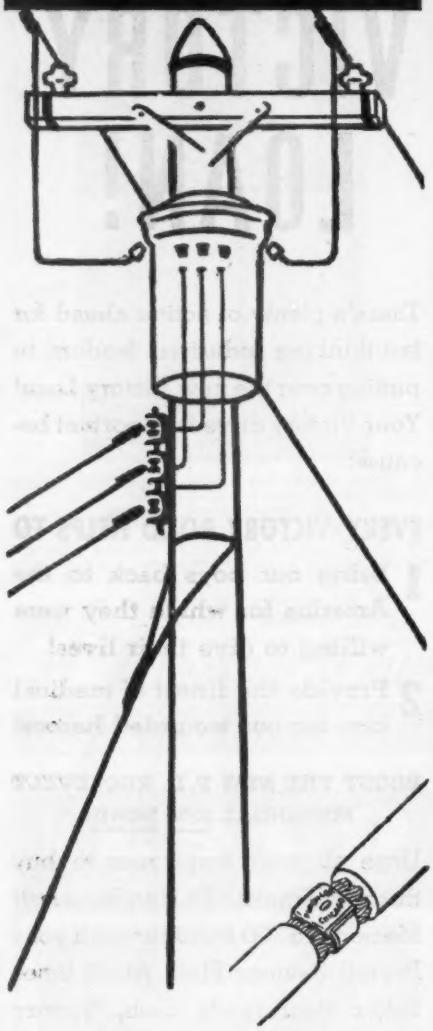
Banding and Splicing Method



With Punch-Lok Clamps, applied with the Loking Tool, you can make connections easily, quickly, simply, safely...without taking down wires or installations. Will withstand any normal pull strain. Many other applications for repairing, banding, splicing, tying.

Write for descriptive catalog and name of nearest distributor

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PUNCH-LOK COMPANY

Dept. R, 321 N. Justine Street
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Recent Rate Changes

COMMUNITY PUBLIC SERVICE CO.'s $8,500 annual reduction in electric rates in Ruidoso, N. M., has been approved by the New Mexico Public Service Commission, according to an announcement made by the office of the Commission Chairman W. W. Nichols. The reduction, effective with August billings, is approximately $3,370 on residential and approximately $5,130 on commercial bills. The commission said the cuts amounted to 30 percent of residential and 40 percent of commercial bills.

NOVA SCOTIA PUBLIC UTILITIES BOARD has dismissed an application from a group of customers of the Cobequid Power Co. for a reduction in domestic and commercial rates at Debert, Londonderry, Great Village and Bass River in Nova Scotia. The hearing was held at Truro, N. S. In its judgment on the application, the board ruled there is no argument that the rates are higher than prevailing in some parts of Nova Scotia, and based on the records of 1944, the board is satisfied the present rates are not higher than is reasonable and just.

CONSOLIDATED GAS ELECTRIC LIGHT & POWER CO.'s rate dispute moved another step toward solution with the filing of five briefs in the two cases before the Maryland Public Service Commisson. Closing arguments are scheduled to extend through Octber 12, with two days allotted to counsel for the company and two to the complainants. The briefs recently submitted brought to seven the number before the commission. Represented in them are the company, the Mayor and City Council of Baltimore, the people's counsel to the Public Service Commissin, Rustless Iron & Steel Corp., the County Commissioners of Baltimore County, Bethlehem-Fairfield Shipyard, Inc., and a group of taxpayers.

•

TVA to Send First Power to Virginia to Serve Co-op

The first Tennessee Valley Authority power to be sent into Virginia will go to the Powell Valley Electric Cooperative, Davis L. McNeil, manager of the co-op, has revealed in announcing that a contract for power had been signed with TVA.

A new transmission line, approximately 22 miles long, will be built from a point near Rogersville in Hawkins County, Tenn., to the load center of the co-op in Lee County, Va.

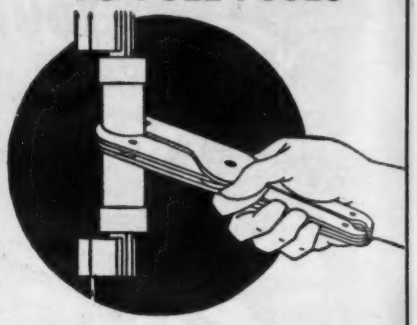
The co-op now has 450 miles of distribution lines in Lee, Wise, and Scott Counties, Va., and in Hancock, Hawkins, and Claiborne Counties, Tenn. It has been buying its power from Old Dominion Power Co.

•

Se-Ma-No Co-op Formed

The Se-Ma-No Electric Cooperative of Wright County has been organized with headquarters at Mansfield, Mo. All members live in the vicinity of Seymour, Mansfield, and Norwood.

THE SAFEST WAY TO PULL FUSES



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10,000,000 STRONG RIGHT ARMS

Victory did *not* end the paper shortage. Need for waste paper is as great as ever.

Why? Because supplies must still be shipped in paper to our occupation forces and liberated countries. For the Pacific area these take double and triple wrapping to withstand long sea voyages and tropical climates.

Meanwhile, demand for domestic packaging paper comes from scores of reconverted industries. Jobs and shipments of new goods depend on *paper*, the essential protection of almost everything made in our factories.

That's why you should designate one place as your Salvage Corner. Collect all your waste paper there before you bundle and turn it in. If you're in doubt about how to get it picked up, call your local newspaper or Salvage Committee.

So appoint a Salvage Chief in your office. Give him the authority to organize a Salvage Team. Have him contact the local Salvage Committee and work with them.

ELECTRICAL WORLD

This advertisement prepared by the War Advertising Council. Space contributed by this publication.

You always find the
EXACTLY RIGHT
Terminal Lug—

in the COMPLETE line

You'll see ALL good types of terminals in the Penn-Union Catalog. Shown above is the EZ; below are a few pictures giving an idea of the wide variety:

All good Pressure and Solder Terminals

Sheet Metal Terminals—Hundreds of Types

Also Tees, Taps, Straight Connectors, Grounding Clamps, etc. etc., thousands of items. And every one is Dependable, mechanically and electrically. Penn-Union fittings are the first choice of experienced users.

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ELECTRIC CORPORATION
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PENN-UNION
Conductor Fittings

LETTERS TO THE EDITOR

Boosting Without Interruption

To the Editor of ELECTRICAL WORLD:

The article by T. A. Gunderson entitled "Fused Jumper Set Has Many Uses" (ELECTRICAL WORLD, July 21, page 148) states that a booster transformer can be cut into the circuit "with only a few seconds interruption". There is a way of doing this with two of his jumpers without any interruption.

One of the two jumpers in the diagram in the article would contain a fuse cutout and the other a solid blade disconnect. The jumper with the fuse is connected between A and B, and then the conductor between these points can be removed; the other jumper contains the disconnect and connects the terminal of the booster coil to the boosted line.

By closing the blade at BC there results a momentary shorting of the secondary of the transformer used as a booster which will blow the fuse F. Thus the booster is cut in without an interruption.

J. B. Clapp
Manager, Utility Division
Thomas & Betts Co
Elizabeth, New Jersey

Mechanical Value of a Kilowatt-Hour

To the Editor of ELECTRICAL WORLD:

The strike of the elevator operators in certain parts of New York City brings to mind an interesting analogy which it occurs to me might be of interest as representing the mechanical value of a kilowatt-hour, which many utilities sell to their customers for the price of a postage stamp, or less!

Assuming, for a brief moment, that there was no elevator service in a building like the Empire State Building, a man weighing 150 lb. could carry a package weighing 100 lb., say, up 1,000 ft. to the top of the building from the street, making the trip about ten times, to produce energy equivalent to one kilowatt-hour, for which he might pay his lighting company 3 cents. Figures of this kind, if presented to the consumers of power, might make them appreciate the value of their electrical energy more highly than some of them do now.

Sidney Withington
Electrical Engineer
New York, New Haven & Hartford Railroad Co.
New Haven, Conn.

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for Street and Highway Use

Will not blow over, leaving your men and the public unprotected.

Sign frame pivoted on each side allowing movement with varying wind pressures and full vision at all times.

Attractively and rigidly constructed; folds compactly for storing.

IPCO **COMPLETE INFORMATION ON NEW BULLETIN EW-105**
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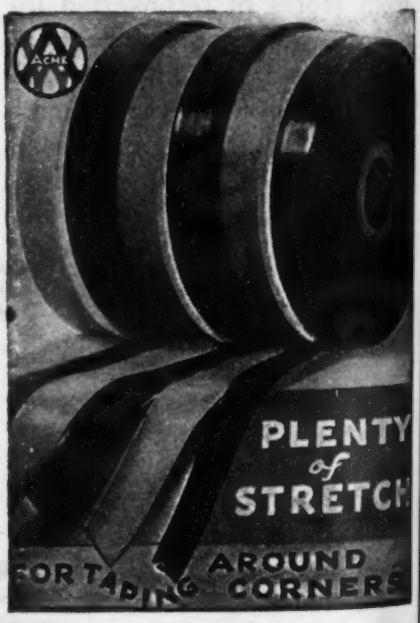

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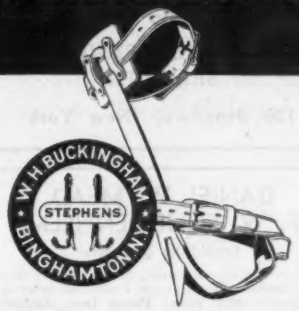
are made of high grade cotton fabric treated with special varnishes from Acme's own varnish plant. They have great tensile strength and flexibility and may be stretched snugly into all corners and crevices, making a mechanically smooth and electrically efficient seal. Offered in bias or straight tapes or rolls up to 36" wide, yellow or black. Samples if requested. Address *The Acme Wire Co., New Haven, Conn.*

Acme Wire Products
VARNISHED INSULATIONS — MAGNET WIRE
COILS

Good Equipment Is Applied Common Sense



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BUCKINGHAM Equipment has proven its worth over a period of 40 years. It is now in general use by the United States Army Signal Corps and leading Utility Companies.

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ALL the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

American Transformer Enters Lighting Field

American Transformer Co., Newark, N. J., manufacturer of transformers since 1901, has recently entered the lighting field. This marks a new departure for the concern which hitherto has confined its activity to electronic, radio, and industrial equipment.

The first item manufactured in the new field is a fluorescent lamp ballast, and these will be sold by the manufacturers representatives already carrying the company's other products.

•

Formica President Tells Employees of Work Ahead

In a signed message sent to all members of the organization, D. J. O'Conor, president of Formica Insulation Co. assured employees that "the demand for insulation materials is immediate and the outlook is excellent." In assuring the personnel of employment he added that "within a few months we will have a steady stream of material flowing through our factory at a rate surpassing anything we have produced in pre-war days."

•

Expands Electronics Unit

Ending of war contracts in the Westinghouse industrial electronics division in Baltimore, Md., has resulted in immediate expansion of the engineering section which is building the first "stratovision" units for flight tests of airborne television and FM radio transmission, according to Walter Evans, vice-president in charge of all Westinghouse radio activities.

Indications are, he said, that the equipment will be ready before the snow flies. The section is headed by Charles E. Nobles, radar expert who devised the plan.

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IMPROVED PATTERNS OF GREATER UTILITY. Formed-flexible Finishing Cloths. Catch Cloths. Crotch Cloths. New Type Cloth for Vertical Joints.

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Rating:
100 Amperes 250 Volts
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5000 Amperes

You can fuse them with any make of standard primary fuse links.

They indicate outages.

For isolating service entrance faults; for protecting banked transformer secondaries; or for protecting transformers from secondary faults, Matthews Secondary Cutouts have proved themselves very efficient and low-in-cost for many years.

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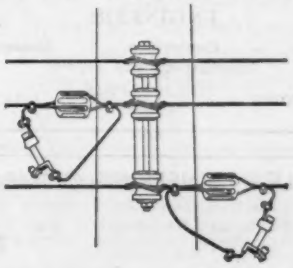

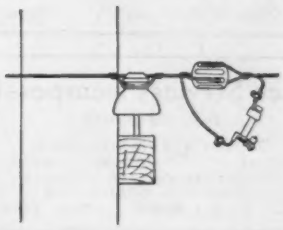

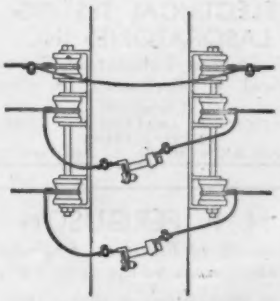

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1304 St. Paul Street Baltimore 2, Md.

Westinghouse Will Expand Production

Orders Backlog $329,000,000—Set to Hold Price Line on Appliances to Check Inflation

Westinghouse Electric Corp. has launched an extensive production program at its steam division and the new aviation division in Philadelphia that will give employment to more than 6,000 people, L. E. Osborne, vice-president, has announced. With this personnel, which is 50 percent greater than the pre-war maximum at the Philadelphia plant, Westinghouse will turn out electric power-producing equipment to speed the nation's reconversion.

Production of peacetime goods at the steam division in 1946 is estimated at $23,000,000 in value, Mr. Osborne said. Normal pre-war business at the division averaged $14,000,000 a year.

A. W. Robertson, chairman of the board, stated that war contract terminations of $205,000,000 in booking value have left the company's backlog of unfilled orders as of September 15 at $329,000,000. "Allowing for all Government and other contracts that may yet be subject to termination," Mr. Robertson added, "unfilled orders remaining constitute a production load considerably higher than the $239,431,448 net sales billed in 1940, the highest pre-war year in the company's history."

New electrical appliances made by the company's Appliance Division, soon to reach trade and consumer channels, will be priced at their last pre-war levels, J. H. Ashbaugh, vice-president stated recently. He said that the decision to "hold the line" on prices is a "direct fight against inflationary trends," although "there is little doubt that many cost factors applying to the line of Westinghouse home appliances have increased over what they were on pre-war lines."

•

New Testing Procedures Get Approval of A.S.T.M.

Several important new specifications and testing procedures for widely used materials were accepted by the American Society for Testing Materials' Committee E-10 on Standards at a recent meeting. Also, numerous revisions were approved for publication in existing formal standards and tentatives.

Groups of recommendations came from technical committees on electrical deposited metallic coatings; metal powders and powder products; paint, varnish, lacquer, and related materials; shipping containers; and water for industrial uses; also from the committee responsible for methods of chemical analysis of metals.

All of these specifications, both new and revised, will be published by the Society during the fall, and in addition to being available separately will be included in the 1945 Supplement to the Book of Standards which will be issued late in December.

•

G. E. Compiles New Book for Appliance Retailers

Identify your store as an electrical appliance store if you want to build sales and be able to meet competition in good times or bad. This is the advice now being given to appliance retailers by General Electric Co. in a new book entitled "Your G-E Appliance Store."

On the basis of a survey made specially for the company by Walter D. Teague, designer and industrial consultant, the new publication offers concrete suggestions for the unified design of five basic types of appliance stores.

Included in the book, in addition to the section on store fronts and arrangements, are chapters telling where to locate a new appliance store; how much space to allow for the appliance display stock and how to use light.

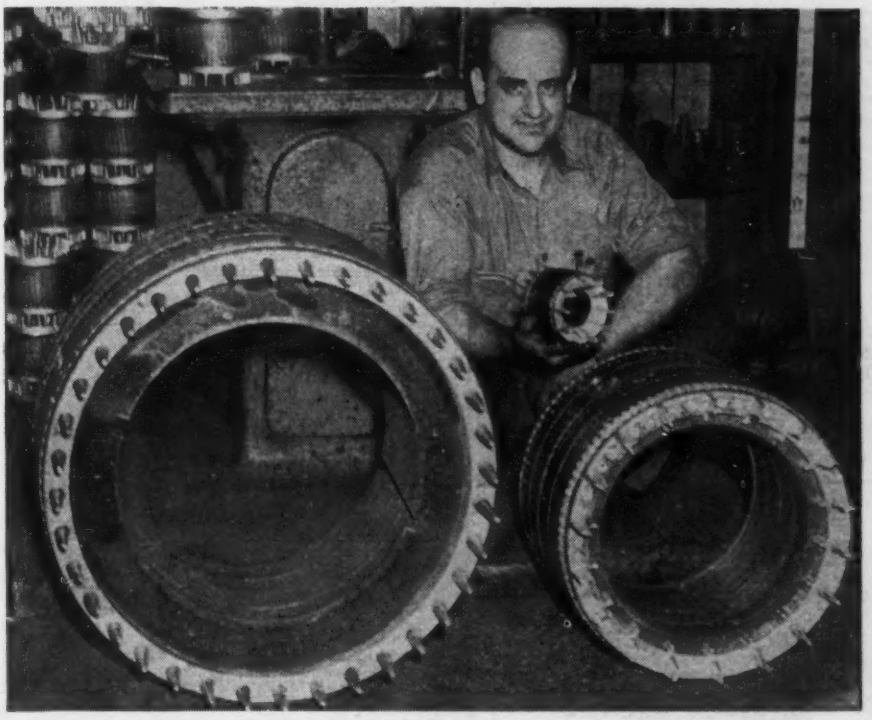
NEMA's Armored Cable Film Shown to Industry

A motion picture "The Armored Cable System of Wiring" had its premiere October 4, in New York. It is sponsored by the Armored Conductor and Flexible Metallic Conduit Section of the National Electrical Manufacturers Association. The picture shows in a popular way the complete manufacturing processes and testing of armored cable and its component parts.

The film is an important phase of the NEMA program, an educational and promotional project intended to demonstrate to the various industry groups the important part which this pioneer wiring material will assume in meeting the tremendous post-war demands for an adequate, flexible, safe, and economical wiring system.

A companion picture dealing with the wide range of applications and approved methods of installing armored cable is under consideration for future release.

Presentation of the films and technical talks and discussions relative to the Sections' products will be carried on by Henry M. Dreher, the Section's Electrical Engineer. In his nationwide travels, Mr. Dreher will meet with various industry groups such as electrical wholesalers, contractors, engineers, inspection authorities and electrical leagues.



PRESSURE-CAST ALUMINUM ROTORS—Reliance Electric & Engineering Co., Cleveland, has succeeded in casting 30-in. aluminum rotors for use in special-purpose 250-hp., 360-rpm. motors for automobile body presses. Peter Voloshen, casting supervisor, holds a 5¼-in. rotor for a 1½-hp., 1,800-rpm. motor. At the left is the 30-in. casting and at the right a 20-in. rotor for a 200-hp. motor

WANTED

PERSONNEL SUPERVISOR

Excellent opportunity with large mid-west utility. College graduate under 40 years of age. Should have at least 5 years' experience in utility personnel work; able to handle job classification, merit rating, employment techniques, testing, special studies and related personnel development; able to get along well with people. Send full particulars of education, experience, background, earnings and salary expected; enclose a recent photograph.

P-100, Electrical World
520 North Michigan Ave., Chicago 11, Ill.

ELECTRICAL ENGINEERS

Experienced graduate engineers wanted by old consulting engineering organization located in New York City. Opening for power station, substation and industrial design engineers. Also distribution engineers thoroughly qualified for economic studies, design layouts, equipment specifications and supervising preparation construction drawings for electric utility systems and industrial installations. Also engineers experienced or interested in training for work on corrosion and cathodic protection of buried metal structures. Applicants please state age, education, experience record, draft status, salary desired, and attach recent photograph.

P-949, Electrical World
330 West 42nd St., New York 18, N. Y.

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P-935, Electrical World
330 West 42nd St. New York 18, N. Y.

WANTED:
SUPERINTENDENT OF POWER PLANT
Will Pay reasonable salary for Superintendent and Manager of Municipally Owned Electric Plant at Murray, Kentucky. City of 5,000, has TVA power, State College, Two Hospitals, Modern Facilities. Situated Near Kentucky Lake and Proposed State Park. Write

Robert S. Jones, *Chairman*
Electric Plant Board, Murray, Kentucky

POSITIONS VACANT

WANTED: GRADUATE Electrical engineer, experienced in either electric or telephone utility operation. Age 30 to 35. Opening will be with State Utility Commission. State age, education, experience and salary expected. Give references. P-963, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

RESIDENT ENGINEERS and staking party chiefs experienced rural line construction preferably on REA projects. Permanent work with established engineering firm in midwest. Apply by letter giving full information. P-977, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: POWER and distribution transformer manufacturer wants an electrical engineer for design work, with or without experience, position open immediately. Write P-978, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: GRADUATE mechanical engineers for Power Supply and Production Department of a midwestern utility organization. Applicants should preferably have had experience in power plant operation but not essential. Give complete details in first letter as to qualifications, education, experience and compensation expected. Enclose recent snapshot. P-987, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

DESIGNING DRAFTSMAN with Safety Switch experience wanted immediately by established eastern manufacturer in permanent position with good future to design and redesign enclosed switches and panelboards. Also layout and design of required tooling for production including sheet steel enclosures. State details of age, experience, availability and salary expected. P-998, Electrical World, 330 W. 42nd St., New York 18, N. Y.

WANTED: ELECTRICAL or mechanical engineer with experience in steam-generating plants and some knowledge of small diesel and ice plants, to become assistant to manager of production of a public utility with a 30,000 kw steam plant and 40,000-50,000 customers. Excellent opportunity and attractive salary for qualified man of 27 to 35 interested in consulting and supervisory work. Write giving experience, salary expected, etc., to P-102, Electrical World, 330 W. 42nd St., New York 18, N. Y.

EXPERIENCED MERCHANDISING man executive position for one of our clients we have open an unusual opportunity for man of executive caliber, able to get along with people, experienced in the sale of household gas and electric appliances—no buying—no sales budgets to meet. Position permanent. Knowledge of advertising and selling helpful but not essential. Give complete details in letter including snapshot. Hugo Wagensell, Talbott Bldg., Dayton, Ohio.

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POSITIONS WANTED

UTILITY ACCOUNTANT, 25 years experience in operating and holding company and regulatory commission accounting, including 16 years in responsible supervisory positions. Presently employed in administrative accounting position in utility industry. PW-966, Electrical World, 330 W. 42nd St., New York 18, N. Y.

SUPERVISING POSITION wanted: U. S. or foreign countries: Thoroughly familiar with all phases of power plant operation, with production and maintenance. Fourteen years experience with private utility, now with Federal hydro plants using all modern equipment. Best of references. PW-967, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

NINETEEN YEARS design, construction, maintenance, and operation—power plants, refrigeration, central heating, air conditioning. Electrical graduate, formerly with electric utility, now naval (engineering) officer, qualified for immediate discharge. Desire new responsible connection, either with consulting firm, or supervising all phases engineering for firm with number of plants.

PW-101, Electrical World
68 Post St., San Francisco 6, Calif.

POSITIONS WANTED

METER ENGINEER, twenty years experience in metering methods tests and repair, load tests and plant survey work. Also experienced in meter reading problems and public relations. PW-990, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ALASKA: ELECTRICAL Engineer acquainted with people and conditions in Alaska desires contact with firm establishing business in territory. PW-991, Electrical World, 68 Post St., San Francisco 4, Calif.

ELECTRICAL CONSTRUCTION: Foreman superintendent requires position. Experience covers installations for light, power, sound. Construction and transmission, full job supervision, field estimates, layout and material requisitioning. Married, willing to travel anywhere for post-war reconstruction, Canada, United States or Europe. In reply PW-103, Electrical World, 330 W. 42nd St., New York 18, N. Y.

ELECTRICAL ENGINEER, age 30. 8 years experience in chemical plant electrical management and design (control and power). Desires executive position in midwest. PW-104, Electrical World, 330 W. 42nd St., New York 18, N. Y.

ENGINEERING DRAFTSMAN—21 years utility drafting and design on substation, distribution, transmission and gas construction, technical graduate. Now with Public Power district, desires to make change. Western, Central or North Central location desired. Married, one child, 39 years of age. PW-105, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL TRADE school graduate, twenty-seven years practical experience in power house operating and industrial maintenance with change of location, California preferred. PW-106, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL SUPERINTENDENT or foreman. Twenty-six years experience construction and maintenance. Steam and hydro electric generating stations, sub-stations and industrial plants, switchboards, control, automatic equipment, meters, relays. Age 45, married, location South or Southwest. Must be permanent. PW-107, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINEER-ECONOMIST soon open to consider connection of responsibility with progressive utility company or service organization cognizant of present importance and future indispensability of competent direction of a continuing coordinated program of internal and general economic research, planning and analytical interpretation; embracing comprehensive and selective load and appliance placement, progressive rate design and continuing comprehensive unit-cost-to-serve evaluations, centrally administered and/or correlated with sales promotion, market analysis, customer relations, distribution design, and other complementary economic factors important to realization of healthy return as the inevitable downward trend of rates continues. Evidence and references as to background, ability, performance, character and personality readily available. (See ad BO-109 under Business Opportunity.) PW-108, Electrical World, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITY

WOULD CONSIDER furnishing some capital with full time personal services in independent consulting or service type organization where annual personal realization in the approximate $10,000-$20,000 range is probable. (See ad PW-108 under Position Wanted.) BO-109, Electrical World, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITY WANTED

ESTABLISHED REPRESENTATION: offered for sale of production products to electrical and mechanical manufacturers in Philadelphia area. Please advise products and commission arrangement. RA-996, Electrical World, 330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER, age 37, desires position with manufacturer or merchandiser of power or lighting equipment in Middle Atlantic states. Construction, design, application, promotional and executive experience. Minimum salary $5,000. SA-110, Electrical World, 330 W. 42nd St., New York 18, N. Y.